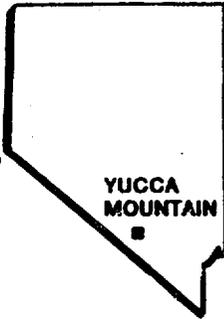


U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN PROJECT

YUCCA MOUNTAIN PROJECT EXPLORATORY SHAFT FACILITY TITLE I DESIGN

SUMMARY REPORT

VOLUME 3B

OUTLINE SPECIFICATIONS



UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

NNT-881221-0033

8901040339 Part 3

H&N

**YUCCA MOUNTAIN PROJECT EXPLORATORY SHAFT FACILITY
TITLE I DESIGN SUMMARY REPORT**

SPECIFICATIONS
FOR
TITLE I DESIGN
FOR THE
YUCCA MOUNTAIN PROJECT

REVISION 0

WBS #1.2.6

SUBMITTED BY: Joseph C. Calovini
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DATE: 12/15/88

HOLMES & NARVER, INC.
ENERGY SUPPORT DIVISION

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DIVISION 1

GENERAL

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01600	Materials and Equipment
01720	Project Record Documents

DIVISION 1

GENERAL

SECTION: 01005

TITLE: ADMINISTRATIVE PROVISIONS

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SECTION 01005

ADMINISTRATIVE PROVISIONS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work sequence
- B. Contractor use of premises
- C. Government occupancy
- D. Government Furnished Equipment
- E. Coordination
- F. Field engineering
- G. Reference standards

1.02 RELATED WORK

- A. Section 01300 - Submittals
- B. Section 01400 - Quality Assurance/Control
- C. Section 01600 - Materials and Equipment
- D. Section 01720 - Project Record Documents

1.03 REFERENCES

- A. Comply with requirements of the standards cited when products are specified by association or trade standards.
 - 1. When more rigid requirements are specified or are required by applicable codes, comply with the most stringent of those requirements.
 - 2. The date of the standard shall be that which is in effect on the bid date or the date of Government-Contractor Agreement when there are no bids, unless specified otherwise.

- B. Obtain copies of standards when required by Contract.
 - 1. Maintain copy at jobsite during progress of the specific work.

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 GOVERNMENT OCCUPANCY

- A. Government will occupy premises during construction.
 - 1. Cooperate with Department of Energy Contracting Officers Representative (DOE/COR) to minimize conflicts and to facilitate Government's operations.

2.02 GOVERNMENT FURNISHED EQUIPMENT

- A. Items noted "Not In Contract" (NIC) will be furnished and installed by the Government.
- B. Items noted "Government Furnished Equipment" (GFE) on the Drawings will be furnished by the Government and installed by the Contractor.
 - 1. Government's responsibilities:
 - a. Arrange for and deliver shop drawings, product data, and samples, where appropriate, to Contractor.
 - b. Arrange and pay for product deliveries to site.
 - c. Inspect products jointly with Contractor on delivery.
 - d. Submit claims for transportation damage.
 - e. Arrange for replacement of damaged, defective, or missing items.
 - f. Arrange for manufacturers' warranties, inspections, and service.

2. Contractor's responsibilities:

- a. Review shop drawings, product data, and samples.
- b. Receive and unload products at site.
- c. Inspect products for completeness and for damage, jointly with Government.
- d. Handle, store, install and finish products.
- e. Repair or replace items damaged by work of this Contract.

C. Items noted "Government Retained Equipment" (GRE) will be removed by the Contractor and retained by the Government.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Construct Project in stages to accommodate Government occupancy requirements during the construction period.
- B. Coordinate construction schedule and operations with the DOE/COR.

3.02 CONTRACTOR USE OF PREMISES

- A. Limit use of premises for construction operations to allow for Government occupancy.
- B. Coordinate use of premises with the DOE/COR.

3.03 COORDINATION

- A. Coordinate work of the various sections of the Specification to ensure efficient and orderly sequence of installation of construction elements.
 1. Provide for items to be installed later.
- B. Verify that characteristics of elements of interrelated operating equipment are compatible.
 1. Coordinate work of various sections for installing, connecting, and placing in service such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the Drawings.

1. Follow routing shown for pipes, ducts, and conduits as closely as practicable.
 2. Make runs parallel with lines of building.
 3. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.
- D. Conceal pipes, ducts, and wiring in the construction, as indicated on the Drawings.
- E. Coordinate locations of fixtures and outlets with finish elements.
- F. Execute cutting and patching to integrate elements of Project.
1. Uncover ill-timed, defective, and non-conforming work.
 2. Provide openings for penetrations of existing surfaces.
 3. Seal penetrations through floors, walls, and ceilings.

3.04 FIELD ENGINEERING

- A. Provide field engineering services. See Section 01050.
- B. Establish grades, lines, and levels by use of recognized engineering survey practices.
- C. Locate and protect control and reference points.

END OF SECTION

DIVISION 1

GENERAL

SECTION: 01050

TITLE: FIELD ENGINEERING

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SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Field engineering services
- B. Surveys for measurement and payment

1.02 RELATED WORK

- A. Section 01720 - Project Record Documents

1.03 REFERENCES

Not used

1.04 SUBMITTALS

- A. Submit names, addresses, and telephone numbers of Surveyor and Engineer before starting survey work.
- B. Submit documentation verifying accuracy of survey work.
- C. Submit certificate signed by Surveyor and Engineer certifying that elevations and locations of improvements are in conformance with the contract documents.
- D. Submit record documents. See Section 01720.
- E. Proof of registration for surveyor and engineer.

1.05 QUALITY ASSURANCE

- A. Surveyor: Land Surveyor registered in the state of Nevada and acceptable to Department of Energy Contracting Officers Representative (DOE/COR).
- B. Engineer: Registered Professional Engineer of the discipline required for specific service on Project. Licensed in the state of Nevada.

PART 2 PRODUCTS

2.01 PROJECT RECORD DOCUMENTS

- A. Maintain complete, accurate log of control and survey work as it progresses.

- B. Submit survey showing dimensions, locations, angles, and elevations of foundation walls and major site improvements.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify locations of survey control points prior to starting work.
 - 1. Notify DOE/COR promptly of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

- A. Protect survey control points prior to starting site work.
 - 1. Preserve permanent reference points during construction.
 - 2. Make no changes without prior written notice to DOE/COR.
- B. Report promptly to DOE/COR the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
 - 1. Replace dislocated points based on original survey control.

3.03 SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent bench marks on site, referenced to established control points.
 - 1. Record locations, with horizontal and vertical data, on project record documents.
- B. Establish lines and levels, locate and lay out by appropriate means:
 - 1. Site improvements, including pavements; stakes for grading, fill and topsoil placement; and utility locations, slopes, and invert elevations
 - 2. Grid or axis for structures
 - 3. Building foundation, column locations, and ground floor elevations

C. Verify periodically layouts by same means.

3.04 SURVEYS FOR MEASUREMENT AND PAYMENT

- A. Perform surveys to determine quantities of unit cost and cost-plus work, including control surveys to establish measurement reference lines. Notify DOE/COR prior to starting work.
- B. Engineer shall calculate and certify quantities for payment purposes.

END OF SECTION

DIVISION 1

GENERAL

SECTION: 01300

TITLE: SUBMITTALS

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Construction schedules
- B. Shop drawings
- C. Product data
- D. Samples
- E. Manufacturers' instructions
- F. Manufacturers' certificates

1.02 RELATED WORK

- A. Section 01005 - Administrative Provisions
- B. Section 01400 - Quality Assurance/Control
- C. Section 01600 - Materials and Equipment

1.03 REFERENCES

- A. Code of Federal Regulations (CFR) 29CFR:
 - OSHA 1910 Occupational Safety and Health Standards
 - OSHA 1926 Safety and Health Regulations for Construction
- B. Department of Energy (DOE):
 - DOE 5480.4 Environmental Protection, Safety, and Health Protection Standards

1.04 SUBMITTALS

- A. Deliver submittals to the Department of Energy Contracting Officers Representative (DOE/COR) at the address listed in the Contract.

- B. Identify Project, Contractor, subcontractors, and supplier on all submittals.
 - 1. Identify pertinent drawing sheet number, detail number, and Specification section number, as appropriate.
 - 2. Provide space for Contractor and DOE/COR review stamps.
- C. Revise and resubmit as required. After DOE/COR review identify changes made since previous submittal.

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 CONSTRUCTION SCHEDULES

- A. Submit horizontal bar chart with separate bar for each major trade or operation, identifying first work day of each week.
- B. Show complete sequence of construction by activity.
 - 1. Identify work of separate stages and other logically grouped activities.
 - 2. Show projected percentage of completion for each item of work at the end of each week.
- C. Show submittal dates required for shop drawings, product data, and samples.
- D. Show product delivery dates, including those for the Government-furnished equipment.

2.02 SHOP DRAWINGS

- A. Submit one transparent and five (5) opaque reproductions of each sheet.
- B. Reproduce and distribute to the applicable subcontractors and suppliers after approval.

2.03 PRODUCT DATA

- A. Mark each copy to identify applicable products, models, options, and other data.

- B. Submit the number of copies which Contractor requires, plus four copies which will be retained by the DOE/COR.
- C. Provide complete data for any hazardous or toxic materials classified as such in DOE 5480.4, OSHA 1910, or OSHA 1926.

2.04 MANUFACTURER'S INSTRUCTIONS

- A. Submit manufacturers' printed instructions for delivery, storage, assembly, installation start-up, adjusting, and finishing, in quantities specified for product data.

2.05 SAMPLES

- A. Submit full range of manufacturers' standard colors, textures, and patterns for DOE/COR selection.
 - 1. Submit samples for selection of finishes within 30 days after date of contract.
- B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices, as required by the DOE/COR.
 - 1. Coordinate submittal of different categories for interfacing work.
- C. Identify each sample. See Paragraph 1.04 B.
- D. Submit one of each sample which will be retained by the DOE/COR.
 - 1. Samples which may be used in the work are indicated in the applicable specification section.

2.06 FIELD SAMPLES

- A. Provide field samples of finishes at Project as required by individual specifications section.
 - 1. Install sample complete and finished.
 - 2. Acceptable samples in place may be retained in completed work.

PART 3 EXECUTION

Not used

END OF SECTION

DIVISION 1

GENERAL

SECTION: 01400

TITLE: QUALITY ASSURANCE/CONTROL

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SECTION 01400

QUALITY ASSURANCE/CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Products
- B. Workmanship
- C. Manufacturers' instructions
- D. Manufacturers' certificates
- E. Field services
- F. Mockups

1.02 RELATED WORK

- A. Section 01005 - Administrative Provisions
- B. Section 01300 - Submittals
- C. Section 01410 - Testing Laboratory Services
- D. Section 01600 - Materials and Equipment

1.03 REFERENCES

- A. HN-10471-1131 - Quality Assurance Program Plan for
Quality Assurance Level I and II Work

1.04 SUBMITTALS

- A. HN-10471-1131 - Quality Assurance Program Plan, Section
13

1.05 QUALITY ASSURANCE

- A. Maintain control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, and site conditions to produce work in accordance with Contract and HN-10471-1131.

PART 2 PRODUCTS

2.01 WORKMANSHIP

- A. Comply with the tolerances and requirements indicated on the Drawings.
- B. Provide competent personnel to produce work of the quality specified.
- C. Secure products in place with positive anchorage devices designed and selected to serve the purpose intended or as shown on the Drawings.
- D. Provide finishes to match approved samples.

2.02 MANUFACTURERS' INSTRUCTIONS

- A. Comply with instructions in full detail.
- B. Perform each step in the sequence specified by the manufacturer.
- C. Request clarification from the Department of Energy Contracting Officers Representative (DOE/COR) before proceeding, should instruction conflict with Contract documents.

2.03 MANUFACTURERS' CERTIFICATES

- A. Submit when required in the individual Specification section:
 - 1. Manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements, executed by a responsible officer of the manufacturer.

2.04 MANUFACTURERS' FIELD SERVICES

- A. When required in the individual Specification section, provide a qualified representative to:
 - 1. Observe field conditions.
 - 2. Observe conditions of surfaces and installation.
 - 3. Observe quality of workmanship.
 - 4. Start up and test equipment.

5. Adjust and balance equipment.
6. Make a written report of observations and recommendations to the DOE/COR.

PART 3 EXECUTION

3.01 MOCKUPS

- A. Tests will be performed as specified.
- B. Assemble and erect complete with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Acceptable mockups-in-place may be retained in completed work.
- D. Remove mockup which are not to remain in place and clear area when work of that section is complete and approved by the DOE/COR.

END OF SECTION

DIVISION 1

GENERAL

SECTION: 01410

TITLE: TESTING LABORATORY SERVICES

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SECTION 01410

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Government-provided testing laboratory services

1.02 RELATED WORK

- A. Section 01005 - Administrative Provisions
- B. Section 01400 - Quality Assurance/Control

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM D3740 Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

ASTM E329 Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

- A. Laboratory will comply with requirements of ASTM E329 and ASTM D3740.
- B. Laboratory will maintain a full-time Registered Professional Engineer on staff to direct services.
- C. Testing equipment will be calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards (NBS) standards or accepted values of natural physical constants.

PART 2 PRODUCTS

2.01 SELECTION AND PAYMENT

- A. Government will select and pay for services of a testing laboratory to perform specified inspections and tests.
- B. Employment of the Laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of the Contract.

2.02 LABORATORY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site after due notice.
- C. Cooperate with Department of Energy Contracting Officers Representative (DOE/COR) and Contractor in performance of services.
- D. Perform specified inspections, sampling, and testing of products in accordance with applicable standards.
- E. Ascertain compliance of materials and mixes with requirements of Contract documents.
- F. Promptly notify the DOE/COR and the Contractor of observed irregularities or non-conformance of work or products.
- G. Perform additional inspections and tests required by the DOE/COR.

2.03 LABORATORY REPORTS

- A. Laboratory will submit promptly two copies of reports to the DOE/COR and to the Contractor after each inspection and test.
 - 1. Include: date issued, Project title and number, name of inspector, date and time of sampling or inspection, identification of product and Specification section, location in the Project, type of inspection or test, date of test, results of tests, and conformance with Contract.
 - 2. When requested by the DOE/COR, provide interpretation of test results.

2.04 LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of the Contract.
- B. Laboratory may not approve or accept any portion of the work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop work.

PART 3 EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

- A. Deliver to the laboratory at designated location, adequate samples of materials proposed to be used which require testing, together with proposed mix designs.
- B. Cooperate with the laboratory personnel and provide access to work.
- C. Provide incidental labor and facilities to:
 - 1. Provide access to work to be tested.
 - 2. Obtain and handle samples at the site or at source of products to be tested.
 - 3. Facilitate tests and inspections.
 - 4. Provide for storage and curing of test samples.
- D. Notify the DOE/COR and the laboratory 24 hours prior to expected time of operations requiring inspection and testing services.

END OF SECTION

DIVISION 1

GENERAL

SECTION: 01600

TITLE: MATERIALS AND EQUIPMENT

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SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Products
- B. Transportation and handling
- C. Storage and protection
- D. Product options
- E. Products list
- F. Substitutions
- G. Systems demonstration

1.02 RELATED WORK

- A. Section 01005 - Administrative Provisions
- B. Section 01400 - Quality Control

1.03 REFERENCES

- A. Code of Federal Regulations (CFR) 29CFR:
 - OSHA 1910 Occupational Safety and Health Standards
 - OSHA 1926 Safety and Health Regulations for Construction
- B. Department of Energy (DOE):
 - DOE 5480.4 Environmental Protection, Safety, and Health Protection Standards

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 PRODUCTS

- A. Apply requirements of this Specification to materials, equipment, and systems.
- B. Comply with all referenced standards and regulations as minimum requirements.
- C. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.
- D. Do not use materials and equipment removed from existing structure, except as specifically required or allowed by the Contract.

2.02 PRODUCT OPTIONS

- A. Provide any product meeting the standards when specified by reference standards or by description only.
- B. Submit a request for substitution for any manufacturer not specifically named.

2.03 PRODUCTS LIST

- A. Submit within 15 days of date of the Contract a complete list of major products proposed for use with name of manufacturer, trade name, and model number of each product.
- B. Tabulate products by Specification section numbers, title, and article number.
- C. Give manufacturer, trade name, model or catalog designation, and reference standards for products specified only by reference standards.
- D. The Department of Energy Contracting Officers Representative (DOE/COR) will reply in writing within ten days if there is any objection to listed items.
 - 1. Failure of the DOE/COR to object to a listed item shall not constitute a waiver of requirements of the Contract.

2.04 SUBSTITUTIONS

- A. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the DOE/COR.

- B. The DOE/COR will determine acceptability of proposed substitution.
 - 1. The DOE/COR will notify Contractor of acceptance or rejection in writing within 10 days.
 - 2. Provide specified product when substitution is not accepted.
- C. Substitutions will not be considered under the following conditions:
 - 1. When they are indicated or implied on shop drawing or product data submittals without separate written request.
 - 2. When acceptance will require substantial revision of Contract documents.

2.05 REQUESTS FOR SUBSTITUTIONS

- A. Submit a separate request for each substitution.
- B. Document each request with complete data substantiating compliance of the proposed substitution with the requirements of the Contract documents.
- C. Identify product by Specification section.
 - 1. Provide manufacturer's name and address, trade name of product, and model or catalog number.
 - 2. List fabricators and suppliers as appropriate.
- D. Attach product data as specified. See Section 01300.
- E. List similar projects using product. Give dates of installation, name of the DOE/COR and name of Government agency.
- F. Give itemized comparison of proposed substitution with specified product.
 - 1. Listing variations.
 - 2. Reference to Specification section.
- G. Give quality and performance comparison between proposed substitution and the specified product.
- H. List availability of maintenance services and replacement materials.

- I. State effect of substitution on construction schedule and changes required in other work or products.

2.06 CONTRACTOR REPRESENTATION

- A. Request for substitution constitutes a representation that Contractor:
 1. Has investigated proposed product and has determined that it is equal to or superior in all respects to specified product.
 2. Will provide same warranty for substitution as for specified product.
 3. Will coordinate installation of accepted substitute making such changes as may be required for project to be complete in all respects.
 4. Waives claims for additional costs related to substitution which may later become apparent.

2.07 SUBMITTAL PROCEDURES

- A. Submit five copies of request for substitution.
- B. The DOE/COR will review Contractor's requests for substitutions with reasonable promptness.
- C. The DOE/COR will record acceptable substitutions in Addenda during the bidding period.
- D. The DOE/COR will notify Contractor promptly, in writing, of decision to accept or reject requested substitution.
- E. Submit shop drawings, product data, and samples accepted products. See Section 01300.

PART 3 EXECUTION

3.01 SHIPPING AND HANDLING

- A. Packaging:
 1. Package finished products in boxes or crates for protection during shipment, handling, and storage.
 2. Protect sensitive products against exposure to elements and moisture.
 3. Protect sensitive equipment and finishes against impact, abrasion, and other damage.

B. Delivery and receiving:

1. Arrange deliveries of products in accordance with construction schedule.
2. Allow time for inspection prior to installation.
3. Coordinate deliveries to avoid conflict with:
 - a. Work and conditions at site
 - b. Limitations on storage space
 - c. Availability of personnel and handling equipment
 - d. Government's use of premises
4. Deliver products in undamaged, dry condition; in original unopened containers or packaging; and with identifying labels intact and legible.
5. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
6. Immediately upon delivery, inspect shipment to ensure:
 - a. Product complies with requirements of Contract documents and approved submittals.
 - b. Quantities are correct.
 - c. Accessories and installation hardware are correct.
 - d. Containers and packages are intact.
 - e. Labels are legible.
 - f. Products are protected and undamaged.

C. Product handling:

1. Provide equipment and personnel to handle products, including those provided by the Government by methods to prevent soiling and damage.
2. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

3. Handle product by methods to avoid bending or overstressing.
4. Lift large and heavy components only at designated lift points.

3.02 STORAGE AND PROTECTION

A. Storage:

1. Store products immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact.
2. Protect until installed.
3. Arrange storage in a manner to provide access for maintenance and inspection.

B. Enclosed storage:

1. Store products subject to damage by the elements in substantial weathertight enclosures.
2. Maintain temperature and humidity within ranges stated in manufacturers' instructions.
3. Provide humidity control and ventilation for sensitive products as required by manufacturers' instructions.
4. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

C. Exterior storage:

1. Provide substantial platforms, blocking, or skids, to support fabricated products above ground.
 - a. Slope ground to provide drainage.
 - b. Protect products from soiling and staining.
2. For products subject to discoloration or deterioration from exposure to the elements:
 - a. Cover with impervious sheet material.
 - b. Provide ventilation to avoid condensation.
3. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

4. Provide surface drainage to prevent water erosion and ponding.
 5. Prevent mixing of refuse, chemically injurious materials, or liquids.
- D. Maintenance of storage:
1. Periodically inspect stored products on a scheduled basis.
 - a. Maintain a log of inspections.
 - b. Make log available to the DOE/COR upon request.
 2. Verify that storage facilities comply with manufacturers' product-storage requirements.
 3. Verify that manufacturer-required environmental conditions are maintained continually.
 4. Verify that surfaces of products exposed to the elements are not adversely affected.
 5. Verify that any weathering of finishes is acceptable under requirements of Contract documents.
- E. Maintenance of equipment storage:
1. For mechanical and electrical equipment in long-term storage, implement manufacturers' storage for each item. Notice of enclosed instructions shall be shown on exterior of package.
 2. Service equipment on a regularly scheduled basis.
 - a. Maintaining a log of services.
 - b. Submit log as a record document.

3.03 SYSTEMS DEMONSTRATION

- A. Prior to final inspection, demonstrate operation of each system to the DOE/COR.
- B. Instruct the Government's personnel in operation, adjustment, and maintenance of equipment and systems. Use the operation and maintenance data as the basis of instruction.

3.04 HAZARDOUS AND TOXIC MATERIALS

A. Observe all local, state, and federal regulations applicable to hazardous and toxic materials classified as such in DOE 5480.4, OSHA 1910, or OSHA 1926.

1. Handling
2. Shipping
3. Storage
4. Protection
5. Labeling

END OF SECTION

DIVISION 1

GENERAL

SECTION: 01720

TITLE: PROJECT RECORD DOCUMENTS

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Maintenance of record documents and samples
- B. Submittal of record documents and samples

1.02 RELATED WORK

- A. Section 01005 - Administrative Provisions
- B. Section 01300 - Submittals

1.03 REFERENCES

- A. NNWSI 88-9 for Quality Assurance Level I and II Work

1.04 SUBMITTALS

- A. Deliver record documents and samples to the Department of Energy Contracting Officers Representative (DOE/COR) at contract closeout. See Section 01700.
- B. Transmit with cover letter in duplicate listing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name, address, and telephone number
 - 4. Number and title of each record document

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.01 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Maintain at the site for the Government one record copy of the following documents:
 - 1. Contract Drawings
 - 2. Specification
 - 3. Addenda
 - 4. Change Orders and other modifications to the Contract
 - 5. Approved shop drawings, product data, and samples
 - 6. Field test records
 - 7. Inspection certificates
 - 8. Manufacturer's certificates
- B. Store record documents and samples in field office apart from documents used for construction.
 - 1. Provide files, racks, and secure storage for record documents and samples.
 - 2. Do not use record documents for construction purposes.
- C. Label and file record documents and samples in accordance with section-number listings in Table of Contents of this Specification.
 - 1. Label each document "PROJECT RECORD" in neat, large, printed letters.
- D. Maintain record documents in a clean, dry and legible condition.
- E. Keep record documents and samples available for inspection by the DOE/COR.

3.02 RECORDING

- A. Record information on a set of blue-line opaque drawings provided by the Government.

- B. Provide felt tip marking pens for recording information. Maintain separate colors for each major system.
- C. Record information concurrently with construction progresses.
- D. Mark Contract Drawings and shop drawings legibly to record actual construction, including:
 - 1. Measured depths of elements of foundation in relation to finish first floor datum
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction
 - 4. Field changes of dimension and detail
 - 5. Changes made by modifications
 - 6. Details not on original Contract Drawings
 - 7. References to related shop drawings and modifications
- E. Maintain other documents required by individual Specification sections.

END OF SECTION

DIVISION 2
SITE WORK
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02211	Rough Grading
02222	Excavation
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02225	Trenching
02500	Site Drainage
02556	Water Lines
02611	Aggregate Base Course
02612	Bituminous Prime Coat
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02614	Bituminous Surface Coat
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02730	Sanitary Sewers
02731	Sewage Disposal Systems
02740	Package Sewer Lift Station
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02831	Fences
02990	Fire Protection Systems - Water

DIVISION 2

SITE WORK

SECTION: 02110

TITLE: SITE CLEARING

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SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Removal of surface debris
- B. Removal of paving, curbs, and concrete slabs and footings
- C. Clearing site of plants and grass
- D. Removal of trees and shrubs
- E. Removal of root systems

1.02 RELATED WORK

- A. Section 02202 - Rock Removal
- B. Section 02211 - Rough Grading
- C. Section 02222 - Excavation

1.03 REFERENCES

Not used

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

1.06 REGULATORY REQUIREMENTS

- A. Coordinate clearing work with utility companies.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified.

3.02 PROTECTION

- A. Protect utilities that are to remain from damage.
- B. Protect trees, plant growth, and features designated to remain.
- C. Protect bench marks and existing work from damage or displacement
- D. Notify the Department of Energy Contracting Officers Representative (DOE/COR) immediately when existing utility lines, whether or not shown on the Drawings, are encountered or damaged.

3.03 CLEARING AND GRUBBING

- A. Clear areas required for access to site and execution of work.
- B. Remove paving, curbs, and concrete slabs and footings.
- C. Remove trees and shrubs within marked areas. Remove stumps, main root balls, and root systems, to a depth of 18 inches.
- D. Remove rocks and boulders larger than 18 inches in diameter unless otherwise directed by the DOE/COR.

3.04 REMOVAL OF IMPROVEMENTS

To be determined.

3.05 DISPOSAL OF WASTE MATERIAL

- A. Remove debris, rocks, and extracted plant life from site.
- B. Dispose of all debris at an approved dump site as otherwise directed by the DOE/COR.
- C. Burning of waste materials on the site will not be permitted.

END OF SECTION

DIVISION 2
SITE WORK
SECTION: 02202
TITLE: ROCK REMOVAL

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PART 2 PRODUCTS

2.01 MATERIALS

- A. Rock: solid mineral material which cannot be ripped using a D-9 bulldozer with a single tooth.
- B. Explosives: the type recommended by explosives firm and as required by the DOE/COR.
- C. Delay devices: the type recommended by the explosives firm.
- D. Blasting mat materials: the type recommended by explosives firm.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify site conditions and report to the DOE/PE any irregularities affecting the work of this section.
- B. Beginning work of this section means acceptance of existing condition.

3.02 MECHANICAL ROCK REMOVAL

- A. Excavate and remove rock by mechanical methods.
- B. Cut away rock at excavation bottom to form level bearing.
- C. Remove shaled layers to provide a sound and unshattered base.
- D. In utility trenches, excavate 6 inches below the invert elevation of the pipe and 24 inches wider than the pipe diameter.
- E. In roadways, excavate 6 inches below the finished grade elevation.
- F. In solid rock excavation, construct slopes to the neat lines staked. Do not allow any rock to overhang or project more than 12 inches from the true slope.
- G. Remove excavated material from the site.
- H. Correct unauthorized rock removal in accordance with backfill and compaction provisions of Section 02223 or with lean concrete fill in accordance with Section 03001, as directed by the DOE/COR.

- I. For pads excavate 4 inches below finished grade.
- J. In drainage channels excavate to finished grade.

3.03 EXPLOSIVE ROCK REMOVAL

- A. If rock is uncovered requiring explosives for disintegration, notify the DOE/COR.
- B. Transport, store, and use explosive materials in accordance with NFPA 495.
- C. Disintegrate rock and remove from excavation.
- D. Cut away rock at excavation bottom to form level bearing.
- E. Remove shaled layers to provide a sound and unshattered base.
- F. Remove excavated material from the site.
- G. Correct unauthorized rock removal or overbreak in accordance with the backfill and compaction provisions of Section 02223 or lean concrete fill in accordance with Section 03001 as directed by the DOE/COR.

END OF SECTION

DIVISION 2
SITE WORK
SECTION: 02211
TITLE: ROUGH GRADING

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SECTION 02211

ROUGH GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Removal of topsoil
- B. Excavation of subsoil
- C. Grading and rough contouring

1.02 RELATED WORK

- A. Section 02110 - Site Clearing
- B. Section 02202 - Rock Removal
- C. Section 02222 - Excavation
- D. Section 02223 - Backfilling
- E. Section 02225 - Trenching

1.03 REFERENCES

Not used

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: excavated material; graded free of roots, rocks larger than one inch, subsoil, debris, and large weeds.
- B. Subsoil: excavated material; graded free of lumps larger than 6 inches, rocks larger than 3 inches, and debris.

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum of topsoil. Remove as directed by the Department of Energy Contracting Officers Representative (DOE/COR).
- B. Identify known below-grade utilities. Stake and flag locations.
- C. Identify and flag above-grade utilities.
- D. Maintain and protect remaining existing utilities which pass through work area.
- E. Notify local responsible agency to remove or relocate utilities.
- F. Upon discovery of unknown utility or concealed conditions, discontinue affected work and notify the DOE/COR.

3.02 TOPSOIL EXCAVATION

- A. Identify required lines, levels, contours, and datum.
- B. Stockpile topsoil as directed by DOE/COR.

3.02 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be regraded and remove excess subsoil not being reused from site.
- B. Stockpile subsoil as directed by DOE/COR.
- C. When excavation through roots is necessary, cut roots with a sharp axe.

3.03 TOLERANCES

- A. Top surface of subgrade: plus or minus one inch.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02222

TITLE: EXCAVATION

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SECTION 02222

EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Building excavation
- B. Shoring

1.02 RELATED WORK

- A. Section 02202 - Rock Removal
- B. Section 02211 - Rough Grading
- B. Section 02223 - Backfilling
- C. Section 02225 - Trenching

1.03 REFERENCES

Not used

1.04 SUBMITTALS

Not used

1.05 QUALITY CONTROL

Not used

1.06 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil falling into excavation.
- B. Underpin adjacent structures which might be damaged by excavation work, including service utilities and pipe chases.
- C. Notify the Department of Energy Contracting Officers Representative (DOE/COR) of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

- D. Protect bottoms of excavations and soil adjacent to and beneath foundations.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Subsoil: excavated material, graded free of lumps larger than 6 inches, rocks larger than 3 inches, and debris.
- B. Pea gravel: mineral aggregate graded from 1/4 inch to 5/8 inch; free of soil, subsoil, clay, shale, or foreign matter.

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum. See Section 01050.
- B. Identify known underground utilities. Stake and flag locations.
- C. Identify and flag surface and aerial utilities.
- D. Notify local responsible agency to remove or relocate utilities.
- E. Maintain and protect existing utilities which pass through work area.

3.02 EXCAVATION

- A. Excavate to the lines, grades, and elevations shown on the Drawings.
- B. Machine slope banks to angle shown on plans.
- C. Remove lumped subsoil, boulders, and rocks up to 1/3 cubic yard.
- D. Remove rocks larger than 1/3 cubic yard in conformance with the provisions of Section 02202.
- E. Fill over-excavated areas. See Section 02223.

- F. Stockpile excavated material in area designated on site and remove excess subsoil as directed by DOE/COR.
- G. Perform excavation so that adequate drainage is maintained.
- H. Use designated borrow areas to obtain fill materials in excess of those produced by excavation.
 - 1. Excavate borrow pits and other excavation areas to preserve adequate drainage.
 - 2. Dispose of overburden and other spoil materials at the location shown on the Drawings or as directed by the DOE/COR.
 - 3. Trim all borrow pits neatly after the excavation is completed.
 - 4. Excavate pits with side slopes no steeper than two horizontal to one vertical .

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02223

TITLE: BACKFILLING

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SECTION 02223

BACKFILLING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Building perimeter backfilling
- B. Site backfilling
- C. Fill under slabs-on-grade

1.02 RELATED WORK

- A. Section 02222 - Excavation
- B. Section 02225 - Trenching

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

- | | |
|------------|---|
| ASTM C136 | Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D1556 | Density of Soil in Place by the Sand-Cone Method |
| ASTM D1557 | Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10 lb (4.54 kg) Rammer and 18 inch (457 mm) Drop |

1.04 SUBMITTALS

Not used

1.05 QUALITY CONTROL

Not used

PART 2 PRODUCTS

2.01 SELECT FILL MATERIALS

- A. Type A - coarse stone: pit run or crushed natural stone; free of shale, clay, friable materials, and debris; graded in accordance with ASTM C136 within the following limits:

Sieve Size	Percent Passing
2 inches	100
One inch	95
3/4 inch	95 to 100
3/8 inch	55 to 85
No. 4	35 to 65
No. 16	15 to 40
No. 40	10 to 25
No. 200	2 to 10

- B. Type B - pea gravel: natural stone; free of clay, shale, and organic matter; sized from 1/4 inch minimum to 5/8 inch maximum.
- C. Type C - sand: natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136 within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 16	10 to 100
No. 40	5 to 90
No. 100	4 to 30
No. 200	0 to 9

2.02 COMMON FILL MATERIALS

- A. Subsoil: reused or imported; free of gravel larger than 3 inch size and debris.

2.03 TESTS

- A. Perform tests and analysis of fill materials in accordance with ASTM D1557.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that stockpiled fill to be reused has been approved by the Department of Energy Contracting Officers Representative (DOE/COR).
- B. Verify that foundation perimeter drainage installation has been inspected.
- C. Verify that foundation is braced to support surcharge forces imposed by backfilling operations.

- D. Verify that areas to be backfilled are free of debris, snow, ice and water and that ground surfaces are not frozen.
- E. Verify that underground tanks have been anchored to their foundations to prevent flotation after backfilling.

3.02 PREPARATION

- A. Compact subgrade surfaces to density requirements for backfill material where area is to receive fill
- B. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with subsoil and compact to the density required for subsequent backfill material.

3.03 BACKFILLING

- A. Backfill areas to the contours and elevations shown on the Drawings. Do not use frozen materials.
- B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
- C. Place and compact select fill materials in continuous layers not exceeding 6 inches compacted depth.
- D. Place and compact common fill material in continuous layers not exceeding 8 inches compacted depth.
- E. Employ a placement method so not to disturb or damage foundation perimeter drainage, foundation waterproofing and protective cover, or utilities in trenches.
- F. Maintain optimum moisture content of backfill materials to attain required compaction density.
- G. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls.
- H. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise.
- I. Make changes in grade gradual. Blend slopes into level areas.
- J. Remove surplus backfill materials from site.
- K. Leave stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

- A. Top surface of backfilling: plus or minus one inch.

3.05 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1556 and under provisions of Section 01410.
- B. If tests indicate work does not meet specified requirements, remove work, replace, and retest.

3.06 SCHEDULE OF LOCATIONS

- A. The table below identifies location and compaction expressed as a percentage of maximum density and optimum moisture in comparison with ASTM D1557.

Area	Percent Compaction
1. Around structures or culverts	95
2. Ground to receive fill	95
3. General fill and embankment	90
4. Upper 12 inches of fill and embankment under concrete slabs	95
5. Road subgrade	95
6. Road shoulders	95

END OF SECTION

DIVISION 2
SITE WORK
SECTION: 02225
TITLE: TRENCHING

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SECTION 02225

TRENCHING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Trenches for utilities
- B. Compacted bed and fill for utilities

1.02 RELATED WORK

- A. Section 01400 - Quality Control
- B. Section 02222 - Excavation
- C. Section 02223 - Backfilling
- D. Section 02556 - Water Lines
- E. Section 02730 - Sanitary Sewers

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM C136 Sieve Analysis of Fine and Coarse
Aggregates

ASTM D1556 Density of Soil in Place by Sand-Cone
Method

ASTM D1557 Moisture-Density Relations of Soils and
Soil-Aggregate Mixture Using 10 lb (4.54
kg) Rammer and 18 inch (457 mm) Drop

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 SELECT BED AND FILL MATERIALS

- A. Type A - coarse stone: pit run or crushed natural stone; free of shale, clay, friable materials, and debris; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
2 inches	100
One inch	95
3/4 inch	95 to 100
3/8 inch	55 to 85
No. 4	35 to 65
No. 16	15 to 40
No. 40	10 to 25
No. 200	2 to 100

- B. Type B - pea gravel: natural stone, free of clay, shale, and organic matter; sized from 1/4 inch minimum to 5/8 inch maximum.

- C. Type C - sand: natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0 to 9

2.02 COMMON FILL MATERIALS

- A. Subsoil: reused or imported; free of gravel larger than three inch size and debris.

2.03 TESTS

- A. Tests and analysis of fill materials will be performed in accordance with ASTM D1557. See Section 01410.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that stockpiled fill to be reused has been approved.

- B. Verify that foundation perimeter drainage installation has been inspected.
- C. Verify that areas to be backfilled are free of debris, snow, ice, or water and that surfaces are not frozen.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum. See Section 01050.
- B. When necessary, compact subgrade surfaces to density requirements for backfill material.

3.03 EXCAVATION

- A. Excavate subsoil required for storm sewer, sanitary sewer, water, and fuel piping.
- B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
- C. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.
- D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard, measured by volume. Remove larger material as specified in Section 02202.
- E. Excavation shall not interfere with normal 45 degree bearing splay of foundations.
- F. Correct unauthorized excavation as directed by the Department of Energy Contracting Officers Representative (DOE/COR).
- G. Fill over-excavated areas under pipe bearing surfaces as directed by the DOE/COR.
- H. Stockpile excavated material in area designated on site and remove from site excess subsoil not being reused.

3.04 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

- C. Notify the DOE/COR of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.

3.05 BACKFILLING

- A. Support pipe and conduit during placement and compaction of bedding fill.
- B. Backfill trenches to contours and elevations. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
- C. Place and compact select fill materials in continuous layers not exceeding 6 inches compacted depth.
- D. Place and compact common fill material in continuous layers not exceeding 8 inches compacted depth.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density.
- F. Remove surplus backfill materials from site.
- G. Leave stockpile areas completely free of excess fill materials.

3.06 TOLERANCES

- A. Top surface of backfill: plus or minus one inch.

3.07 FIELD QUALITY CONTROL

- A. Test compaction in accordance with ASTM D1556. See Section 01410.

3.08 COMPACTION SCHEDULE

- A. Compact pipe bedding and trench backfill as a percentage of maximum density and optimum moisture in comparison with ASTM D1557.

Location	Percent Compaction
1. Lower portion of trenches to 2 feet over utility line	90
2. Trenches from 2 feet over utility line to within 12 inches of surface	90
3. Top 12 inches of trenches	95

END OF SECTION

DIVISION 2
SITE WORK
SECTION: 02500
TITLE: SITE DRAINAGE

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SECTION 02500

SITE DRAINAGE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Storm sewers
- B. Culverts

1.02 RELATED WORK

- A. Section 02225 - Trenching
- B. Section 03001 - Plan and Reinforced Concrete

1.03 REFERENCES

- A. American Association of State Highway Traffic Officials (AASHTO):

AASHTO M 36	Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
AASHTO M 170	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
AASHTO M 196	Corrugated Aluminum Alloy Culverts and Drains

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Alcoa, Inc.
- B. Ameron Corp.
- C. Armco, Inc.

- D. Republic Drainage Products Co.
- E. Substitutions: alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

A. Metal pipe

1. Provide unpaved, galvanized, corrugated metal pipe (CMP) and pipe arch conforming to the Drawings and AASHTO M 36.
2. Provide flared end sections of the manufacturer's standard design and conforming to the requirements for CMP.
3. Ship and handle metal pipe in such a manner as to prevent bruising, scaling, or breaking of the spelter coating.

B. Aluminum pipe

1. Provide corrugated aluminum pipe conforming to the Drawings and AASHTO M 196.

C. Reinforced concrete pipe

1. Provide reinforced concrete pipe of the type, class, and size indicated on the Drawings and conforming to AASHTO M 170.
2. Elliptical pipe will have a continuous axial line painted on the outside of the pipe so that when the pipe is laid in its proper position, the line will be on the top of the pipe.

PART 3

3.01 TRENCHING AND BEDDING

- A. Excavate and backfill trenches in accordance with Section 02225.
- B. Excavate trenches so that the width below the top of the pipe is no greater than the outside diameter of the pipe plus 20 inches.

C. Bedding

1. Provide a bedding surface which will be a firm foundation of uniform density throughout the length of the pipe.
2. Bed the pipe carefully in a tamped soil foundation that has been accurately shaped and molded to conform to the lowest one-fourth of the outside portion of circular pipe or the lower curved portion of pipe arch.
3. Bedding material shall be uniformly graded material, 100% passing number 4 sieve.

3.02 INSTALLATION

A. General

1. Each pipe shall be carefully examined before being laid.
2. Do not use defective or damaged pipe unless repairs, approved by the DOE/COR, can be made to the pipe.
3. Provide proper facilities for lowering sections of pipe into trenches.
4. Ensure that all pipe in place is inspected and accepted before backfilling.
5. Prevent damage to or misalignment of the pipe.

B. Limitations

1. Do not lay pipes in water, on frozen trench bottom, or when, in the opinion of the DOE/COR, the trench conditions or weather are unsuitable for such work.

C. Corrugated metal pipe

1. Lay pipe with sections joined firmly together, with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides.
2. Coat any unprotected metal in the joints of the culvert pipe with bituminous paint.
3. Handle pipe with care during installation to prevent damage to the spelter coating.

4. Prior to placing the backfill, repair damaged areas of the coupling bands and culvert pipe in accordance with AASHTO M 36.
 5. Pipes 48 inches or more in diameter shall be elongated vertically 5% before placement of fill.
 - a. Elongate the vertical diameter by jacking in the field or by prefabrication.
 - b. The method of jacking will be subject to approval of the DOE/COR.
 - c. A tolerance of 25% above or below the specified amount will be allowed.
 6. Where preformed elliptical pipe is used and struts are specified, do not distort the pipe. Wedge the struts tightly in place.
 7. Join CMP or pipe arches, keeping the space between the pipe and connecting bands free from dirt and grit so that the corrugations fit snugly.
 8. Standard field joints
 - a. Make field joints with outside bands.
 - b. Provide the type, size, and number of angles, bands, and bolts specified by the manufacturer.
- D. Reinforced-concrete pipe
1. Bed each pipe section to the established grade line with groove end upstream.
 2. Clear the end of each pipe carefully with a wet brush.
 3. Use sufficient mortar to completely fill the joint and to form a bead on the outside.
 4. Brush smooth the interior surface of the pipe at the joint.
 5. Protect the mortar on the outside from air and sun with a cover of wetted burlap and retain protection until the mortar is satisfactorily cured.

3.03 BACKFILLING FOR PIPE

- A. Backfill as specified in Section 02225.

B. Construction machinery

1. In compacting by rolling or operating heavy equipment parallel to the pipe, avoid displacement of or injury to the pipe.

3.04 HEADWALLS

- A. Construct headwalls in accordance with the details shown on the Drawings.
- B. All concrete work shall conform to the applicable portions of Section 03001.

3.05 BEVELED ENDS

- A. Cut pipe culverts to align with the embankment and the skew.
- B. Repair spelter coating that is damaged during beveling operations as specified in Paragraph 3.02.C.4.

3.06 EARTH COVER

- A. After culverts have been bedded and backfilled as specified in this section, protect with a 4 foot cover of fill material before heavy equipment is permitted to cross.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02556

TITLE: WATER LINES

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PART 1

GENERAL

1.01 Work Included

1.02 Related Work

1.03 References

1.04 Submittals

1.05 Quality Assurance

PART 2

PRODUCTS

2.01 Acceptable Manufacturers

2.02 Pipe and Fittings

2.03 Valves

2.04 Accessories

PART 3 EXECUTION

3.01 Installation of Pipe and Fittings

3.02 Installation of Valves

3.03 Installation of Accessories

3.04 Testing

3.05 Disinfection

DIVISION 2

SITE WORK

SECTION: 02611

TITLE: AGGREGATE BASE COURSE

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SECTION 02611

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Aggregate base course

1.02 RELATED WORK

Not used

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM D1557 Moisture Density Relations of Soils and
Soil Aggregate Mixtures, Using 10 lb.
Rammer and 18 inch Drop

- B. Code of Federal Regulations (CFR) 29CFR:

OSHA 1926 Safety and Health Regulations for
Construction

- C. State of Nevada Department of Highways (SNDH):

SNDH SPEC Standard Specifications for Road and
Bridge Construction

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 MATERIALS

- A. General

1. Select the aggregate for the base course from native material or import with the approval of the Department of Energy Contracting Officers Representative (DOE/COR).

2. Use aggregates that are clean, durable, sound, and free from organic matter.
3. The portion retained on the Number 4 sieve defines the coarse aggregate, and the material passing the Number 4 sieve defines the binder material.

B. Coarse aggregate

1. Provide coarse aggregate which consists of angular fragments, uniform in density and quantity.
2. The amount of flat and elongated particles shall be limited to 30%.
3. A flat particle is one having a ratio of width to thickness greater than 3. An elongated particle is one having a ratio of length to width greater than 3.

C. Pit-run aggregate

1. Pit-run aggregate may be used in the construction of base courses where shown on the drawings or as specified by the DOE/COR.
2. Use pit-run material which is hard, durable, and free from excessive disintegrated pieces, alkali, and vegetable matter.
3. Gradation will be determined by laboratory test.

D. Binder material

1. Use binder material which consists of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.
2. Use binder material of such character that the composite material will conform to Paragraph 2.01.F, Gradation.

E. Deficiencies

1. If the product of a deposit is deficient in material passing the Number 16 sieve, binder material from other approved deposits that meets the requirements specified may be added at the crushing and screening plants.

F. Gradation

1. Use aggregate which conforms to one of the following sieve analyses. The size will be selected after adequate material is produced by the gravel plant to secure representative samples.
2. Use the size selected (1 inch or 1 1/2 inch) for all gravel base produced from the deposit.

Laboratory Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve	
	1 1/2 inch size Type I	1 inch size Type II
1 1/2 inch	100	--
1 inch	80-100	100
3/4 inch	--	90-100
No. 4	30-65	35-65
No. 16	15-40	15-40
No. 200	2-12	2-10

3. Base course shall meet the following tests of Nevada Standard Test Procedures:

Test	Test Method	Requirements
Sieve analysis	Nev. T206	Above
Sampling aggregate	Nev. T200	
Crushed particle	Nev. T230	50 percent minimum
Plasticity index	Nev. T212	Table I*
Liquid limit	Nev. T210	35 maximum
Resistance value (R value)	Nev. T115	78 minimum
Percentage of wear	Nev. T233	45 percent maximum

* See SNDH SPEC, Paragraph 704.02.03.

2.02 EQUIPMENT

- A. Plant and equipment shall meet the applicable requirements of OSHA 1926.

PART 3 EXECUTION

3.01 WORKMANSHIP

- A. Perform all work in conjunction with the construction of the aggregate base course in conformance with this specification and SNDH SPEC, Section 302, as applicable.

3.02 WEATHER LIMITATIONS

- A. Do not construct aggregate base courses when the atmospheric temperature is below 35 degrees F.
- B. Bring areas of completed base courses that are damaged by freezing, rainfall, or other weather conditions into conformance with this specification.

3.03 PREPARATION OF SUBGRADE

- A. Prior to constructing the aggregate base course, clean the previously constructed subgrade of all foreign substances and ensure that it conforms to Section 02211.

3.04 GRADE CONTROL

- A. During construction, maintain the lines and grades indicated for the base by means of line and grade stakes placed by the Contractor or an approved survey team.

3.05 MIXING AND PLACING MATERIALS

- A. Make such adjustments in mixing or placing procedures or in equipment as are necessary to obtain grades within the allowable tolerance, to minimize segregation and degradation, to reduce or accelerate loss or gain of water, and to ensure a satisfactory base course.

3.06 LAYER THICKNESS

- A. Construct the compacted thickness of the base course as indicated on the Drawings.
- B. When a compacted layer of 6 inches is specified, place the material in a single layer.
- C. When a total compacted thickness of more than 6 inches is required, limit any single layer of the placed material to a maximum of 6 inches and to a minimum of 3 inches when compacted.

3.07 COMPACTION

- A. Compact each layer of the base course with mechanical equipment.
- B. Do not use puddling and jetting.
- C. Maintain water content at or near the optimum for compaction.

- D. In all places not accessible to rollers, compact the mixture with mechanical tampers.
- E. Continue compaction until each layer through the full depth is compacted to not less than 95% of maximum density as determined by ASTM D1557.

3.08 EDGES OF BASE COURSE

- A. Place material along the edges of the base course in such quantities as will compact to the thickness of the course being constructed.
- B. When the course is being constructed in 2 or more layers, place material to the thickness of each layer of the course, allowing in each operation at least a one foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the base course.

3.09 PROTECTION

- A. Protect and maintain the base course in a satisfactory condition until the surface course is placed thereon.
- B. If a loss of density occurs in the base course material for any reason, recompact to the specified density prior to placement of any subsequent course.
- C. Provide drainage to protect the base course from the intrusion of surface water.

3.10 FIELD QUALITY CONTROL

- A. Smoothness test
 - 1. Do not allow the surface of any layer to show deviations in excess of 0.04 foot when tested with a 12 foot straightedge applied both parallel with and at right angles to the centerline of the completed area.
 - 2. Ensure that the finished surface of the base course is not more than 0.02 foot from the established grade or accepted cross section with no more than 0.05 foot accumulated deviation between stations.
 - 3. Correct any deviation in excess of these tolerances by removing material, by adding new material, or by reworking existing material and compacting.

B. Thickness control:

1. Complete the base course to a tolerance of plus zero to minus 1/2 inch of the elevation indicated on the Drawings or as approved by the DOE/COR.
2. Excess thickness may be accepted by the DOE/COR provided surface grades and tolerances are met.
3. Measure the thickness of the base course at intervals in such manner that there will be one measurement for each 500 square yards of base course or fraction thereof.
4. Make thickness measurements in test holes 3 or more inches in diameter through the base course.
5. Where the measured thickness of the base course is deficient more than 1/2 inch, correct such areas by scarifying, adding mixture of proper gradation, reblading, and recompacting.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02612

TITLE: BITUMINOUS PRIME COAT

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SECTION 02612

BITUMINOUS PRIME COAT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Bituminous prime coat
- B. Surface preparation

1.02 RELATED WORK

Not used

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM D140 Sampling Bituminous Materials, Methods for
- B. Code of Federal Regulations (CFR) 29CFR:
 - OSHA 1926 Safety and Health Regulations for Construction
- C. State of Nevada Department of Highways (SNDH):
 - SNDH SPEC Standard Specifications for Road and Bridge Construction

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 SAMPLING AND TESTING

- A. Submit samples of bituminous material in accordance with ASTM D140 when required during construction.

- B. Select the source or sources from which the bituminous material is to be obtained before the material is required for use in the work.
- C. Furnish to the Department of Energy Contracting Officers Representative (DOE/COR) the manufacturer's certified test report for each shipment of bituminous material used in the work.

2.02 MATERIALS

- A. Bituminous materials shall conform to the requirements of SNDH SPEC.
- B. Prime coat shall be MC 70 liquid asphalt.

PART 3 EXECUTION

3.01 WEATHER LIMITATIONS

- A. Apply the prime coat only when the subgrade or base course is dry enough to permit uniform distribution and the required penetration.
- B. Do not apply bituminous materials when the atmospheric temperature is below 50 degree F or when weather conditions, in the opinion of the DOE/COR, would prevent proper penetration of the prime coat.

3.02 EQUIPMENT

- A. Equipment shall meet the applicable provisions of OSHA 1926.
- B. Bituminous distributor
 - 1. Equip the distributor to distribute the bituminous material uniformly at an even heat on variable widths of surface at readily determined and controlled rates from 0.2 to 0.5 gallons per square yard.
 - 2. Include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gages, and volume-measuring devices.
 - 3. Provide adequate heaters for heating materials to the proper temperature, a thermometer to show the temperature of tank contents, and a hose attachment suitable for applying bituminous material to spots unavoidably missed by the distributor.

4. Equip distributor to circulate and agitate the bituminous material during the heating process. Insulate the tank. Submit the certification of calibration of the spreadmeter to the DOE/PE.

C. Heating equipment for storage tanks

1. Provide steam coils and equipment for producing steam for heating bituminous material so designed that steam cannot get into the material.
2. Fix an armored thermometer with a range from 40 degrees F to 200 degrees F to the tank so that the temperature of the bituminous material may be read at all times.

3.03 PREPARATION OF SURFACE

- A. Prepare the surface upon which the bituminous prime coat is to be placed to conform to the established lines and grades, to be smooth and uniform, and compacted to the required density.
- B. If the required density deteriorates for any reason between the time the last course was compacted and the time the prime coat is placed, then recompact the surface to the required density.
- C. To assure a uniform spread of the bituminous material when the portion of the subgrade or base course prepared for treatment is excessively dry, sprinkle lightly with water immediately before the application.

3.04 APPLICATION OF BITUMINOUS MATERIAL

- A. Apply the bituminous material, at a temperature of 120 degrees F minimum to 180 degrees maximum, by means of a bituminous distributor.
- B. Unless the distributor is equipped to obtain satisfactory results at the junction of the previous and subsequent applications, spread building paper on the surface of the applied material for a sufficient distance back from the ends of each application so that flow from the sprays may be started and stopped on the paper, and so that all sprayers will operate at full force on the surface to be treated.
- C. Immediately after the application, remove the building paper.

- D. Properly treat all lightly coated areas and spots missed by the distributor with bituminous material applied with a hand spray.
- E. Following the application of bituminous prime coat, allow the surface to dry without being disturbed for a period of not less than 48 hours or as may be necessary to attain penetration into the subgrade or base course and evaporation of the volatiles from the prime coat material.
- F. Furnish and spread enough approved sand to effectively blot up and cure any excess bituminous material.
- G. Maintain the primed surfaces until the surface course is placed, by protecting the surface against damage and by repairing broken spots.
- H. Do not allow smoking, fires, or flames other than the heaters that are a part of the equipment within 25 feet of the heating, distributing, or transferring operations of bituminous materials. This does not apply to bituminous emulsions.

END OF SECTION

DIVISION 2
SITE WORK
SECTION: 02613
TITLE: BITUMINOUS TACK COAT

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SECTION 02613

BITUMINOUS TACK COAT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Bituminous tack coat

1.02 RELATED WORK

Not used

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM D140 Sampling Bituminous Materials, Methods
for

- B. Code of Federal Regulations (CFR) 29CFR:

OSHA 1926 Safety and Health Regulations for
Construction

- C. State of Nevada Department of Highways (SNDH):

SNDH SPEC Standard Specifications for Road and
Bridge Construction

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 SAMPLING AND TESTING

- A. Submit samples of bituminous material in accordance with
ASTM D140 when required during construction.

- B. Select the source or sources from which the bituminous
material is to be obtained before the material is
required for use in the work.

- C. Furnish to the Department of Energy Contracting Officers Representative (DOE/COR) the manufacturer's certified test report for each shipment of bituminous material used in the work.

2.02 MATERIALS

- A. Bituminous materials shall conform to the requirements of SNDH SPEC.
- B. Provide tack coat, unless otherwise shown on the drawings or approved by the DOE/COR, which is SS1 or SS1h, diluted 40% of the emulsified asphalt by weight with water.

PART 3 EXECUTION

3.01 WEATHER LIMITATIONS

- A. Do not apply tack coat when the atmospheric temperature is below 40 degrees F or when weather conditions in the opinion of the DOE/COR, would prevent the proper construction of the tack coat.

3.02 EQUIPMENT

- A. Equipment shall meet the applicable provisions of OSHA 1926.
- B. Bituminous distributor
 1. Equip the distributor to distribute the bituminous material uniformly at an even heat on variable widths of surface at readily determined and controlled rates from 0.05 to 0.15 gallons per square yard.
 2. Include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gages, and volume-measuring devices.
 3. Provide adequate heaters for heating materials to the proper temperature, a thermometer to show the temperature of tank contents, and a hose attachment suitable for applying bituminous material to spots unavoidably missed by the distributor.
 4. Equip distributor to circulate and agitate the bituminous material during the heating process. Insulate the tank. Submit the certification of calibration of the spreadmeter to the DOE/COR.

- C. Heating equipment for storage tanks
 - 1. Provide steam coils and equipment for producing steam for heating bituminous material so designed that steam cannot get into the material.
 - 2. Fix an armored thermometer with a range from 40 degrees F to 200 degrees F to the tank so that the temperature of the bituminous material may be read at all times.
- D. Power brooms and power blowers: use to clean the surfaces to receive tack coat.

3.03 PREPARATION OF SURFACE

- A. Immediately before applying the tack coat, remove all loose material from the surface to be treated, with a power broom or blower, supplemented with hand brooms.
- B. After the cleaning operation, and prior to the application of the tack coat, inspect the area to be treated to determine the fitness of the area to receive the bituminous coating.
- C. Ensure that the portion of the surface prepared for immediate treatment is dry and in a satisfactory condition, except, if the existing pavement temperature is 140 degrees F, or above, the surface of the pavement and all crack faces shall be wetted thoroughly with water.
- D. Ensure all surfaces to be in a uniformly damp condition.
- E. No free water will be allowed on the surface or in the cracks when the bituminous coating is applied.

3.04 APPLICATION OF BITUMINOUS MATERIAL

- A. Apply the bituminous material, at a temperature of 75 degrees F minimum to 130 degrees F maximum, by means of a bituminous distributor.
- B. Uniformly distribute bituminous material at all points of the surface to be treated.
- C. Unless the distributor is equipped to obtain satisfactory results at the junction of the previous and subsequent applications, spread building paper on the surface of the applied material for a sufficient distance back from the ends of each application so that flow from the sprays may be started and stopped on the paper, and so that all sprayers will operate at full force on the surface to be treated.

- D. Immediately after the application, remove the building paper.
- E. Properly treat all lightly coated areas and spots missed by the distributor with bituminous material applied with a hand spray.
- F. Following the application of the bituminous material allow the surface to dry until it is in a proper condition of tackiness to receive the surface course.
- G. Apply the bituminous coating only so far in advance of surface course placement as will be covered during the following 36 hours.
- H. Protect and maintain the treated surface until the succeeding layer of pavement has been placed.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02614

TITLE: BITUMINOUS SURFACE COURSE

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SECTION 02614 .

BITUMINOUS SURFACE COURSE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Hot-mix surface course

1.02 RELATED WORK

- A. Section 02611 - Aggregate Base Course
- B. Section 02612 - Bituminous Prime Coat
- C. Section 02613 - Bituminous Tack Coat

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM C136 Sieve Analysis of Fine and Course Aggregates, Method for
 - ASTM D140 Sampling Bituminous Materials, Methods for
 - ASTM D1559 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
 - ASTM D1560 Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - AASHTO M 17 Mineral Filler for Bituminous Paving Mixtures
 - AASHTO T 19 Unit Weight and Voids in Aggregate
 - AASHTO M 20 Penetrating Graded Asphalt Cement
 - AASHTO T 89 Determining the Liquid Limit of Soils
 - AASHTO T 90 Determining the Plastic Limit and Plasticity Index of Soils

AASHTO T 96 Resistance to Abrasion of Small Size
Coarse Aggregate by Use of the Los
Angeles Machine

AASHTO T 104 Soundness of Aggregate by Use of
Sodium Sulfate or Magnesium Sulfate

AASHTO T 182 Coating and Stripping of Bitumen-
Aggregate Mixtures

C. State of Nevada Department of Highways (SNDH):

SNDH SPEC Standard Specifications for Road and
Bridge Construction

D. Code of Federal Regulations (CFR) 29CFR:

OSHA 1926 Safety and Health Regulation for
Construction

1.04 SUBMITTALS

A. Submit samples of bituminous material in accordance with
ASTM D 140 when required during construction.

B. Furnish to the Department of Energy Contracting Officers
Representative (DOE/COR) the manufacturer's certified
test report for each shipment of bituminous material
used in the work.

1.05 QUALITY ASSURANCE

A. Select the source or sources from which the bituminous
material is to be obtained before the material is
required for use in the work.

PART 2 PRODUCTS

2.01 AGGREGATE

A. Provide aggregate which consists of crushed stone,
crushed gravel or crushed slag with or without sand or
other inert finely divided mineral aggregate.

B. Aggregate shall be composed of sound, tough, durable
particles that are free from clay balls, organic matter,
and other deleterious substances.

C. The aggregate shall not contain more than 8%, by weight
of flat or elongate pieces.

- D. Coarse aggregate (Retained on the Number 8 Sieve):
1. Shall show no more than 40% wear when tested in accordance with AASHTO T 96.
 2. Shall show no signs of disintegration, no sodium sulfate soundness loss exceed 9%, and no the magnesium soundness loss exceed 12%, when tested in accordance with AASHTO T 104.
 3. Shall have at least 75% be weight of particles with at least 2 fractured faces and at least 90% by weight of particles with one or more fractured faces.
- E. Slag shall be air-cooled, blast-furnace slag, and have a compacted weight of not less than 70 pounds per cubic foot when tested in accordance with AASHTO T 19.
- F. Fine aggregate, including any blended filler, shall have a plasticity index of not more than 6 when tested in accordance with AASHTO T 90, and a liquid limit of not more than 25 when tested in accordance with AASHTO T 89.
- G. Mineral filler, if required, shall consist of stone dust, loess, portland cement, or other approved mineral matter. The filler material shall meet the requirements of AASHTO M 17.
- H. Mineral aggregate shall be of such size that the percentage composition by weight as determined by ASTM C136 will conform to the gradation or gradations specified below unless otherwise approved by the DOE/COR.

Sieve Size	Percentage by Weight Passing Sieve		
	Type 1	Type 2 *	Type 3
1 inch	100	----	----
3/4 inch	82-100	100	----
1/2 inch	70-90	82-100	100
3/8 inch	60-82	68-90	82-100
No. 4	42-70	50-79	56-88
No. 10	30-60	36-67	40-75
No. 40	15-40	17-44	19-48
No. 80	8-26	9-29	10-32
No. 200	3-9	3-9	3-10

2.02 BITUMINOUS MATERIAL

- A. Bituminous material shall be asphalt cement grade 85-100 or 120-150 as designated by the DOE/COR.

- B. Bituminous material shall meet the requirements of AASHTO M 20.
- C. Mixing temperature shall be 275 degrees F minimum to 325 maximum.

2.03 BITUMINOUS MIXTURE

- A. Bitumen content of the mixture shall be calculated on the percentage basis by weight of the total mix and shall fall within the ranges given below.

	Type 1	Type 2	Type 3
Bitumen percent:			
Stone or gravel	4.5-7.0	5.0-7.5	5.5--8.0
Slag	6.0-9.0	6.5-9.5	7.0-10.0

- B. The bituminous mix shall not show evidence of stripping when tested in accordance with AASHTO T 182. Antistrip agents shall be used if necessary.
- C. The bituminous mixture shall meet the requirements of one of the following ASTM tests plus the limitations on voids, voids filled, and swell:

ASTM D1559:

Number of blows each end of specimen	- - -	75
Stability (Minimum)	- - - - -	1800
Flow (Maximum) hundredths of an inch	- - -	16
Flow (Minimum) hundredths of an inch	- - -	8
Percent voids	- - - - -	3 to 5
Percent voids filled with bitumen	- -	70 to 80

ASTM D1660:

Stabilometer (Min)	- - - - -	40
Cohesimeter (Min)	- - - - -	50
Swell, inches (Max)	- - - -	0.030
Percent voids (Min)	- - - -	4

2.04 JOB-MIX FORMULA

- A. Work shall not begin nor shall any mixture be accepted until the Contractor has submitted samples of the materials intended for use and a satisfactory job-mix formula has been established under the direction of the DOE/COR for each mixture to be used.
- B. The job-mix formula for each mixture shall be in effect until modified in writing by the DOE/COR.

- C. The job-mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve, a single percentage of bituminous material to be added to the aggregate, and a single temperature at which the mixture is to be delivered at the point of discharge.
- D. The gradations in Paragraph 2.01.H of this section represent the limits which shall determine the suitability of aggregate for use from the sources of supply. The final gradations decided upon within the limits designated in the table shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.
- E. The selection of any of the gradations shown in Paragraph 2.01.H of this section shall be such that the maximum size aggregate used shall not be more than one half the thickness of the layer of the surface course being constructed.
- F. After the job-mix formula is established, all mixtures furnished for the project shall conform thereto within the following tolerances plus or minus:

Passing No. 4 and larger sieves - - - - -	7%
Passing No. 8 to No. 100 sieves (inclusive) - -	4%
Passing No. 200 sieve - - - - -	2%
Bitumen - - - - -	0.4%
Temperature of mix - - - - -	20 F

- G. Should there be a change in the sources of material, a new job-mix formula will be established before the new material is used.
- H. When unsatisfactory results make it necessary, the DOE/COR may establish a new job-mix formula and so notify the Contractor in writing. "

2.05 PLANT, EQUIPMENT, MACHINES, AND TOOLS

- A. Use plant, equipment, machines, and tools which meet the applicable provisions of OSHA 1926.

2.06 MIXING PLANTS

- A. Mixing plants shall conform to the requirements of the SNDH SPEC.

2.07 OTHER EQUIPMENT

A. Hauling Equipment

1. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds. The beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material to prevent the mixture from adhering to them.
2. Each truck shall have a suitable cover to protect the mixture from adverse weather and an insulated bed to maintain the mixture at the specified temperature.

B. Bituminous pavers

1. Bituminous pavers shall be self-contained power-propelled units with an activated screed or strike-off assembly, heated if necessary.
2. Bituminous pavers shall be capable of spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness, and grade.
3. Bituminous pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of bituminous plant mix material in widths shown on the plans.
4. The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.
5. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.
6. The paver shall be capable of operating at forward speeds consistent with satisfactory laying of the mixture.

C. Rollers

1. Rollers shall be in good condition, capable of reversing without backlash and operating at slow speeds to avoid displacement of the bituminous mixture.

2. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while the mixture is still in a workable condition.
3. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

D. Blowers and brooms

1. Blowers and brooms shall be of the power type and shall be suitable for cleaning the surface to be paved.

E. Saws

1. Saws shall be of the power type and shall be capable of rapidly cutting pavement and trimming joints and edges of pavement.

F. Scales

1. Scales shall be standard, beam-type truck scales equipped with an accurate weight-recording device and shall be of sufficient size and capacity to accommodate all trucks to be used in handling bituminous mixtures.

PART 3 EXECUTION

3.01 PREPARATION FOR PLACING

A. Weather limitations

1. Bituminous courses shall be constructed only when the base course or existing pavement is dry and when the weather is not rainy.
2. No mixture shall be placed when the air temperature in the shade and away from artificial heat is 40 degrees F or lower unless so directed by the DOE/COR.

B. Surface preparation

1. Immediately before placing the bituminous mixture, the existing underlying course shall be cleaned of loose or deleterious material. A power sweeper equipped with a blower shall be used, supplemented with hand brooms if necessary.

C. Reconditioning of base course

1. The surface of the base course will be inspected for adequate compaction and surface tolerances specified in Section 02611.
2. Ruts or soft yielding spots that may appear in the base course and areas having inadequate compaction and deviations of the surface from the requirements specified for the base course shall be corrected by loosening the affected areas, removing unsatisfactory material and adding approved material where required, and reshaping and compacting to line and grade and to the specified density.

D. Prime Coat

1. When shown on the drawings, a prime coat shall be applied to the compacted roadbed in accordance with Section 02612.

E. Tack Coat

1. Contact surfaces of previously constructed pavement, curbs, manholes and similar structures shall be sprayed with a thin coat of bituminous material in accordance with Section 02613.

F. Grade Control

1. Grade control between the edges of the pavement shall be accomplished by grade stakes or steel pins placed in lanes parallel to the centerline of the pavement and at intervals sufficiently close that string lines may be stretched between stakes or pins.

3.02 TRANSPORTATION AND DELIVERY OF THE MIXTURE

- A. The mixture shall be transported from the mixing plant to the point of use in vehicles described in Paragraph 2.07.A.
- B. The mixture shall be placed at a temperature between 250 and 300 degrees F.
- C. Loads shall not be sent out as to interfere with spreading and compacting the mixture during daylight unless artificial light, satisfactory to the DOE/COR, is provided.

3.03 SPREADING AND LAYING

- A. Placing shall commence at the point(s) farthest from the mixing plant and progress continuously toward the plant unless otherwise approved by the DOE/COR.
- B. Hauling over material already placed shall not be permitted until the material has been thoroughly compacted as specified, and allowed to cool to atmospheric temperature.
- C. Machine Spreading
 1. Upon arrival, the mixture shall be dumped into an approved bituminous paver and immediately spread to the full depth required.
 2. The mixture shall be struck off in a uniform layer of such depth that, when the work is completed, it will have the required thickness and will conform to the grade and surface contour required.
 3. The speed of the paver shall be regulated to eliminate pulling and tearing of the bituminous mat.
 4. The mixture shall be placed in consecutive adjacent strips of convenient widths to cover the complete area. To ensure proper drainage, the spreading shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.
 5. After the first strip or width has been compacted, the second width shall be placed, finished and compacted in the same manner as the first width.
 6. After the second strip has been placed and rolled, a 10 foot straightedge shall be placed across the longitudinal joint to determine if the surface conforms to grade and contour requirements.
 7. Exposed vertical edges of paved strips shall be free of all accumulations of dirt or other foreign material before any mixture is spread in an adjacent lane. If joint faces become dry or dusty, the contact surfaces should be given a brush coat of asphalt.

8. If the spreading machine should drift from an adjacent lane during construction, the unfilled space shall be carefully filled with fresh hot mixture obtained from the truck or hopper of the spreading machine. Stealing mixture from that already spread to fill up these areas shall not be permitted.
9. In areas where, because of irregular or unavoidable obstacles, the use of mechanical spreading and finishing equipment is impractical, the mixture may be hand spread.
10. When hand spreading is permitted, the mixture shall be dumped on approved dump sheets outside the area upon which it is to be spread, and then distributed into place immediately with hot shovels. It shall be spread with hot rakes in a uniformly loose layer to the full width required and of such depth that, when the work is completed, it will have the required thickness and will conform to the grade and surface contour shown on the drawings.

3.04 COMPACTION OF MIXTURE

- A. After spreading, the mixture shall be thoroughly and uniformly compacted with power rollers. Rolling shall begin as soon after spreading as the mixture will bear the roller without undue displacement or hair checking.
- B. On the first strip spread, rolling shall start in the center and continue toward either edge. On subsequent strips laid, rolling shall start on the edge adjacent to previously laid material and continue toward the opposite edge.
- C. Initial rolling shall be done longitudinally. The rollers shall overlap on successive trips. Alternate trips of the roller shall be of slightly different lengths.
- D. The speed of the roller shall be slow to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once by rakes and fresh mixture.
- E. Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until all roller marks are eliminated, the surface is of uniform texture and true to grade and cross section, and a density of at least 98% of the laboratory density specified in Paragraph 2.03.C of this section. Field density tests shall be made at least twice daily.

- F. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excessive water will not be permitted.
- G. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers.
- H. Any mixture which becomes loose and broken, mixed with dirt, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. Skin patching will not be allowed.

3.05 JOINTS

A. General

- 1. The mixture at the joints shall comply with the surface requirements and present the same uniformity of texture, density, and smoothness as other sections of the course.
- 2. In the formation of all joints, provision shall be made for proper bond with the adjacent course for the specified depth of the course.
- 3. Joints shall be formed by cutting back on the previous day's run to expose the full depth of the course; the exposed edge shall be given a light coat of asphalt or tar as specified by the DOE/COR.
- 4. The fresh mixture shall be raked against the joint and thoroughly tamped and rolled.

B. Transverse joints

- 1. The placing of the course shall be as continuous as possible. The roller shall pass over the unprotected end of the freshly laid mixture only when discontinuing the laying of the course.

C. Longitudinal joints

- 1. The placing of the course shall be as specified in such a manner that the joint is exposed for the shortest period possible. The joint shall be placed so that it will not coincide with that in the base, binder, or existing surface course by at least one foot.

3.06 SHAPING EDGES

- A. While the surface is being compacted and finished the Contractor shall carefully trim the outside edges of the pavement to the proper alignment. Edges so formed shall be beveled while still hot with the back of a rake or a smoothing iron and thoroughly compacted by tampers or other satisfactory methods.

3.07 SURFACE REQUIREMENTS

- A. The surface course, upon completion of final rolling, shall be smooth and true to grade and cross section.
 - 1. When a 10 foot straightedge is laid on the surface parallel with the centerline, the surface shall not vary more than 1/8 inch from the straightedge.
 - 2. When a 10 foot straightedge is laid on the surface transverse to the centerline between the crown and edge of pavement, the surface shall not vary more than 1/4 inch from the straightedge.
- B. Low or defective areas shall be immediately corrected by cutting out the faulty areas and replacing them with fresh, hot mixture and compacting the area to conform to the remainder of the pavement.

3.08 ASPHALT FOG SEAL

- A. When specified on the drawings, the surface of the entire completed surface treatment shall be sealed with asphalt emulsion SS 1h or CSS 1h diluted with equal amounts of water and applied at a coverage rate of 0.1 to 0.2 gallons of diluted material per square yard. New pavement surfaces shall be allowed to cure for a period of not less than 7 days before application of the fog seal unless otherwise approved by the DOE/COR.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02615

TITLE: ROAD WORK

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SECTION 02615

ROAD WORK

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Roadmix surfaced roads
- B. Bituminous surface-treated roads
- C. Gravel-surfaced roads
- D. Native soil roads
- E. Slurry coated roads, storage, and parking areas

1.02 RELATED WORK

- A. Section 02211 - Rough Grading
- B. Section 02222 - Excavation
- C. Section 02223 - Backfilling
- D. Section 02611 - Aggregate Base Course
- E. Section 02612 - Bituminous Prime Coat
- F. Section 02613 - Bituminous Tack Coat
- G. Section 02614 - Bituminous Surface Course

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM C136 Sieve Analysis of Fine and Coarse Aggregates, Test Methods for
 - ASTM D140 Sampling Bituminous Materials, Methods for
 - ASTM D1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. Rammer and 18 in. Drop, Test Methods for
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - AASHTO T 2 Sampling Aggregates

- AASHTO T 96 Resistance to Abrasion of Small Size
Coarse Aggregate by Use of the Los
Angeles Machine
- AASHTO T 104 Soundness of Aggregate by Use of Sodium
Sulfate or Magnesium Sulfate
- AASHTO T 182 Coating and Stripping of Bitumen -
Aggregate Mixtures

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 SAMPLING AND TESTING

- A. Submit samples of bituminous material in accordance with
ASTM D140 when required during construction.
- B. Select the source or sources from which the bituminous
material is to be obtained before the material is
required for use in the work.
- C. Furnish to the Department of Energy Contracting Officers
Representative (DOE/COR) the manufacturer's certified
test report for each shipment of bituminous material
used in the work.

2.02 MATERIALS

A. Asphalt material

1. Use MC 250 or MC 800 asphalt unless otherwise shown
on the Drawings or approved by the DOE/COR.
2. Use SC 250 asphalt for patching mixes to be
stockpiled for long periods before use.

B. Aggregate

1. Provide aggregate meeting requirements of Section
02614, Paragraph 2.01.
2. When the mineral aggregate consists of material in
place in the roadbed, remove all rocks or lumps of
material larger than 2 1/2 inches in greatest
dimension.

PART 3 EXECUTION

3.01 EXCAVATION AND BASE

A. Excavation and embankment and preparation of roadbed

1. Perform excavation and embankment and preparation of roadbed as shown on the drawings. See Sections 02222 and 02223.

B. Prime coat

1. Apply a prime coat to the compacted roadbed as shown on the Drawings. See Section 02612.

C. Placing aggregate

1. After the prime coat has had sufficient time to penetrate and dry, place the required amount of mineral aggregate on the roadbed.
 - a. Spread smoothly and uniformly over one-half of the roadbed.
 - b. When a traveling mixing plant is used, form the loose aggregate into a windrow or windrows or into a blanket of uniform cross section.

D. Application of bituminous material

1. Provide the type and grade of bituminous material indicated on the Drawings.
2. Distribute the material uniformly.
3. During application maintain the temperature of the bituminous material within the range specified on the Drawings.
4. After each application, partially mix the aggregate and the bituminous material in the mixing equipment so that a minimum of bituminous material is left.
5. The intervals between applications shall be as shown on the Drawings.
6. Do not spread bituminous materials when the DOE/COR has determined that weather conditions would prevent proper application or when the atmospheric temperature is below 50 degrees F.

7. Do not apply more bituminous material than can be mixed with the aggregate on the same day it is applied.

3.02 ROADMIX SURFACE

A. The materials may be mixed upon the roadbed or upon some other approved area off the roadbed by roadmixing methods, or the material may be mixed by plant-mix methods as specified below at the option of the Contractor.

B. Machine-mixed roadmix method

1. In lieu of mixing the material as specified above, a roadmixing machine or other equipment may be employed if the completed mixture is equal to the product specified.
2. Before mixing, place the loose materials in windrows or in a blanket of uniform cross section large enough to allow all material in the windrow or blanket to pass through the mixing machine at each mixing operation.
3. Provide a pugmill or auger-type roadmixing machine, which will pick up the loose material from the mixing area or which will cut a true plane in the material at a specified depth.
 - a. No loose material shall be left in either case.
 - b. Ensure that the bituminous material is introduced through a metering device at the time of mixing.
4. Equip the machine to provide positive control of the amount of bituminous binder introduced into the mix and which can be readily adjusted to the changes required.
5. Regulate the rate of movement of the roadmixing machine, the amount of the material mixed, and the amount of mixing so that the resulting mixture is uniform and of unchanging appearance. All particles of aggregate should be thoroughly coated with bituminous material.
6. Ensure that materials mixed off the roadbed are uniform in character and equal in all respects to that which would be produced by mixing on the roadbed as above specified.

D. Plant-mixing method

1. At the Contractor's option, a central mixing plant and plant-mix method may be used.
2. Dry, proportion, and mix the mineral aggregate with the bituminous material in accordance with the applicable requirements of Section 02614 with the following modifications:
 - a. When the moisture content of the mineral aggregate does not exceed 2% by weight of the dry aggregate, and laboratory tests indicate that such increased moisture content will not produce an unstable mixture, the DOE/COR may approve the mixing of the materials without passing the aggregate through a dryer.
3. Unless otherwise approved by the DOE/COR, separation of the mineral aggregate into required sizes and storing in separate bins shall not be required.

E. Spreading, compacting, and finishing

1. Spreading and compacting equipment shall conform to the requirements of Section 02614, except that the use of a self-propelled mechanical spreading and finishing machine shall not be required.
2. Before the finished mixture is spread for compaction make a triangular cut with a motor grader at each edge of the base course to provide for a thickened edge of bituminous mixture.
 - a. Make the cut approximately 2 inches deep at the outer edge and slope to zero, 2 feet in toward the center.
 - b. In making a cut, ensure that the excavated material is thrown to the edge of the roadbed in a small windrow against which the mixture shall then be spread.
3. After roadmixing operations have been completed and the mixture has been approved by the DOE/COR, uniformly spread the mixture over the area to be surfaced to the proper width and to such depth as will compact to the required thickness.
 - a. The Contractor may elect to mix the materials prior to the delivery on the roadbed, as provided above.

4. Begin spreading the mixture on the roadbed at the point or points farthest from the point of mixing and progress continuously toward the point of mixing unless otherwise approved by the DOE/COR.
 - a. Spread the mixture by means of a spreader box.
 - b. Do not segregate coarse or fine particles and ensure that the mixture is free from lumps or pockets of coarse and fine material after spreading.
5. After the mixture has been spread, remove approximately the top half of the material by motor graders and place into a windrow on one side.
6. Place the windrow so that earth or other extraneous materials will not become intermixed with the windrowed material.
7. Thoroughly roll the exposed area not occupied by the windrow; then move the windrow and roll the area occupied by the windrow.
 - a. Provide continuous rolling throughout the spreading operations.
 - b. Respread the windrowed material over the entire surface by alternating the windrow from one side of the roadbed to the other and to the center.
 - c. Gradually decrease the amount of material moved until the entire surface has uniform texture, is smooth and true to cross section and grade, and is uniformly compacted.
8. During blading and rolling, move all lumps and loose stones to the outside of the surface area and dispose of them.
9. Perform all rolling, except for the final finish rolling, as specified under Section 02614. Begin at the lower edge and progress toward the highest portion.
10. Do not under any circumstances roll the highest portion first.

3.03 ASPHALT FOG SEAL

- A. When specified on the Drawings, seal the surface with asphalt emulsion in accordance with Section 02614, Paragraph 3.08.

3.04 BITUMINOUS SURFACE TREATMENT AND AGGREGATE SEAL COAT

- A. Place sprayed asphalt with cover aggregate over a compacted native soil base. When shown on the Drawings, prime the compacted base.
- B. Weather limitations
 - 1. Do not apply bituminous materials when weather conditions are unsuitable, atmospheric temperature is below 65 degrees F, or the surface temperature is below 80 degrees F.
- C. Equipment
 - 1. Provide heating equipment, bituminous distributors, aggregate spreaders, rollers, and other equipment for use in the work. See Sections 02611, 02612, and 02614.
 - 2. Limit the weight of the rollers so that crushing of the aggregate will not occur.
- D. Materials
 - 1. Ensure that the gradation of aggregates conforms to the following requirements:

Screenings	Percentage by Weight Passing Sieve	
Sieve Sizes	1/2" Size	3/8" Size
1/2 Inch	100	---
3/8 Inch	90-100	100
Number 4	15-35	20-45
Number 16	0-4	0-6
Number 200	0-2	0-2

Project Control Tests	Test Method	Requirements
Sieve analysis	ASTM C136	Above
Sampling aggregate	AASHTO T 2	-----
Fractured faces		90% minimum

Source Requirement Test	Test Method	Requirements
Stripping test	AASHTO T 182	Satisfactory
Percentage of wear (500 Rev.)	AASHTO T 96	40% maximum
Soundness:	AASHTO T 104	
Sodium Sulfate Loss		09% maximum
Magnesium Sulfate Loss		12% maximum

2. Provide bituminous material which is emulsified CRS 2 asphalt applied at a temperature of 110 degrees F minimum to 160 degrees F maximum unless otherwise noted on the drawings or approved by the DOE/COR.

E. Preparation of base

1. Strip the native soil base of all vegetation, scarify to a minimum depth of 6 inches, disc or otherwise break up, moisten or aerate as necessary, thoroughly mix, grade, and compact to 95% of maximum density as determined by ASTM D1557.
2. Where additional native material is required to raise the base to required elevation, borrow suitable material locally from areas approved by the DOE/COR.

F. Application of surfacing

1. Surfacing shall not be applied prior to review and approval of the base by the DOE/COR.
2. Prime coat or tack coat, where required by the drawings, shall be applied in accordance with Section 02612 or 02613 as applicable.
3. Surfacing.
 - a. Before applying asphalt to the primed or unprimed base, check and properly adjust the asphalt distributor and the aggregate spreader for the quantities of materials to be applied.
 - b. Fill the aggregate spreader and have it in place and ready for operations before the asphalt is sprayed.
 - c. After the spraying operation commences, operate the aggregate spreader in close proximity to the asphalt distributor and ensure that the road speed of the equipment is uniform.
 - d. Spray the asphalt uniformly in the quantity specified.
 - e. Where field conditions require changes in quantity, asphalt coverage will be as approved by the DOE/COR.

4. Rolling
 - a. Use pneumatic-tired rollers to embed the aggregate in the asphalt.
 - b. Take care to avoid crushing the aggregate.
5. Multiple surfacing
 - a. When double or triple surface treatments are specified on the drawings, roll each course before subsequent applications of asphalt and aggregate.

3.05 GRAVEL-SURFACED ROADS

- A. This type of surface consists of the application and compaction of gravel over compacted native material base.
- B. Aggregate
 1. Provide a size of aggregate and thickness of the gravel surface course in accordance with the Drawings.
 2. Aggregate gradation shall conform to the requirements of Section 02611, Paragraph 2.01, unless otherwise noted on the Drawings or approved by the DOE/COR.
 3. Testing of the aggregate will be the responsibility of the DOE/COR.
- C. Prepare the base upon which the gravel surfacing is placed. See Sections 02222 and 02223.
- D. Place and compact the aggregate. See Section 02611.

3.06 BLADED AND GRADED ROADS

- A. Construct bladed and graded roads consisting of scarified, graded, bladed, and compacted native soil.
- B. Construction
 1. Construct bladed and graded roads to approximately follow the natural contours of the roadway.
 2. Where excessively steep contours are encountered, construct embankments as shown on the Drawings or as approved by the DOE/COR.

3. Compact embankment to 90% of maximum density determined by ASTM D1557, for the full depth of the placed material.

3.07 SLURRY SEAL COAT

- A. Provide slurry seal coat consisting of a mixture of fine aggregate, mixing type asphaltic emulsion, and water. Apply to existing pavement containing hairline and alligatored cracks, ravelling, ruts, and depressions.

B. Materials

1. Provide aggregate consisting of fine sand or a combination of sand and crusher dust, 100% passing a Number 8 sieve, 60 to 90% passing a Number 30 sieve, and 3 to 10% passing a Number 200 sieve.
2. Use a gradation in the mix which will vary according to the condition of the pavement and be determined by tests.
3. Emulsified asphalt shall conform to Section 02613.

C. Batching

1. Prepare typical batch quantities, subject to slight adjustments to suit field conditions as follows:

Using portable mixer:	Aggregate--fine	700 lb.
	Emulsified asphalt	30 gal.
	Water--(variable)	15 gal.*

Using transit-mix truck (3 cu. yd.):	Aggregate--fine	3,000 lb.
	Aggregate--plaster sand	<u>3,000 lb.</u>
	Total	6,000 lb.
	Emulsified asphalt	120 gal.
	Water--(*variable)	80 gal.*

* Includes water in the emulsified asphalt and the water that may be present in the aggregates.

D. Mixing

1. The Contractor may mix using either portable mixing equipment similar to the paddle-type plaster mixer or transit mix truck.
2. When transit mix equipment is used, preclude the formation of balls in the mix.

3. Proper control of consistency shall be maintained to ensure a creamy, freeflowing slurry.
4. Field mixing time shall be approved by the DOE/COR.

E. Spreading

1. Use a spreader box equipped with an adjustable strike-off or squeegee.
2. Clean the pavement with a power broom. Blow out dirt and dust in cracks.
3. Apply a tack coat of diluted emulsified asphalt to the existing pavement. See Section 02613.
4. After the tack coat has dried to the proper condition of tackiness and prior to application of the slurry, dampen the pavement ahead of the spreader box.
5. Apply slurry seal coating at a thickness of 1/16 inch to 1/8 inch, except in depressed areas where the thickness shall vary accordingly.

F. Protection

1. Protect the coated pavement from traffic damage until properly cured.
2. Permit no traffic over the surface for a period of one hour after application of the slurry coat.

3.08 DUST CONTROL

- A. Apply an emulsified-asphalt dust palliative to the road in areas requiring the control of dust.
 1. Use SS 1 or CSS 1 emulsified asphalt as noted on the Drawings or as directed by the DOE/COR.
 2. Dilute the asphalt emulsion with one part water to one part emulsified asphalt and thoroughly mix prior to distribution, unless otherwise specified by the manufacturer or approved by the DOE/COR.
 3. Apply the bituminous material in conformance with Section 02613.
- B. Apply chemical-biological enzyme soil conditioner.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02720

TITLE: ROADWAY APPURTENANCES

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SECTION 02720

ROADWAY APPURTENANCES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Guide posts
- B. Culvert markers
- C. Roadway signs
- D. Roadway paint striping

1.02 RELATED WORK

Not used

1.03 REFERENCES

A. Federal Specifications (FS):

- FS TT-B-1325A Beads (Glass Spheres, Retroreflective)
- FS TT-P-85E Paint, Traffic: (Reflectized for Airfield Runway Marking (Drop on type))
- FS TT-P-115E Paint, Traffic, Highway, White, and Yellow

B. State of Nevada Department of Transportation (NDOT):

- NDOT SPEC Standard Specifications for Road and Bridge Construction

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 TESTING

- A. Testing, where necessary, will be the responsibility of the Department of Energy Contracting Officers Representative (DOE/COR).

- B. Assist in taking samples of materials and appurtenances to be tested when requested by the DOE/COR.
- 2.02 GUIDE POSTS AND CULVERT MARKERS
- A. Guide posts and culvert markers shall conform to the details shown on the Drawings and shall be erected at locations indicated.
 - B. Guide posts and culvert markers shall be metal.
 - C. Materials
 - 1. Metal posts shall be manufactured of 10 or 11 gauge steel with permissible thickness variation of 0.010 inch.
 - 2. The posts shall be straight, manufactured as one continuous piece of metal with no welded joints, and free of sharp corners and rough surfaces or edges.
 - 3. The posts shall be galvanized.
 - 4. Target plates shall be fabricated of steel or aluminum sheet.
 - 5. Sheet steel shall be 18 gauge; aluminum shall be 0.050 inch thick, alloy 3105-H25.
 - 6. Target plates fabricated from steel sheet shall be galvanized.
 - 7. Any flaking of spelter around punched holes shall be cause for rejection.
 - 8. Plates shall be cut to size and shape and the holes punched for mounting bolts in accordance with the details shown on the drawings.
 - 9. Surfaces and edges of the plates shall be free from defects resulting from fabrication.
 - 10. All fabricating of steel plates, including shearing, cutting, and punching of holes, shall be done prior to enameling.
 - D. Finishing
 - 1. Surface preparation

- a. Steel target plates shall be prepared by bonderizing or other approved process. Prepare the aluminum target plates for painting with chemical conversion coating.
- b. Apply the coating in accordance with the manufacturer's specifications and recommended sequence of operation.

2. Painting

- a. Use accepted alkydmelamine type baking enamel for the white enamel finish coat on target plates as well as black enamel tops, where indicated.
- b. A portion of the alkyd or amino resins may be replaced with a suitable vinyl resin providing the baking enamel meets all the specified performance requirements.
- c. Application of the baking enamel may be by spray, roller, or dip.
- d. Apply a minimum dry-film thickness of the baked-enamel coating on the galvanized steel plates of 2.0 mils on both front and back surfaces.
- e. Ensure a dry-film thickness on both front and back surfaces of the aluminum plates not less than 1.5 mils on each side, if enamel is applied by spray or dip method, and not less than 1.0 mil, if enamel is applied by continuous roller coat method.
- f. Provide a coating which is uniform throughout and smooth and free from flow lines, streaks, blisters, or other surface imperfections.
- g. Use a method of baking which is the standard of the manufacturer of the target plates used in the work.
- h. Ensure that the finished plates are free from dents and defects. Limit the maximum surface deviation from a horizontal plane on which the finished plate lies to 0.25 inch.
- i. Do not paint galvanized posts.

E. Hardware

1. For attaching the target plates use hardware consisting of round-head, galvanized, 1/4 inch machine screws with "Parkerized" treatment with aluminum-finished speed nuts.
2. Provide washers of 5/16 inch I.D. asbestos, not less than 1/32 inch thick.

F. Reflectors

1. Provide reflectors of a reflectorized material of silver color such as 3M "Scotchlite" or approved equal.
2. Reflectorized materials shall be the design shown on the drawings and applied after erection.
3. Attach the reflectorized material firmly to the target plates by means of an adhesive designed specifically for this purpose.

G. Plastic delineator posts

1. Provide plastic delineator posts which are diamond shaped, 6 inch wide x 3/8 inch thick x 6 feet long.
2. Provide complete delineator posts with black plastic caps and 3 inch diameter reflection crystals attached 8 inches from the top.
3. Ensure that erection and location are as indicated on the Drawings.

2.03 ROADWAY SIGNS

A. Provide roadway signs of the types and quantities indicated on the drawings and install where indicated. Signs may be of steel or aluminum, as manufacturing by Hawkins-Hawkins Co., Inc., Berkley, California, or approved equal.

B. Steel signs

1. Manufacture steel signs from galvanized, bonderized steel sheet not less than 18 gauge prior to zinc coating.
2. Use a synthetic, color-fast, alkyd-melamine type baking enamel.

3. Ensure that application and mil thickness are as specified for guide posts and culvert markers.

C. Aluminum signs

1. Manufacturer aluminum signs, 12 inches x 18 inches and smaller, from 0.050 inch, alloy 3105-H25, aluminum sheet.
2. Make signs larger than 12 inch x 18 inch from 0.063 inch, alloy 6061-T6, aluminum sheet.
3. Prepare the aluminum for painting with a chemical conversion coating.
4. Provide a finish of baked enamel as specified for steel signs.

D. Sign posts

1. Form sign posts of hot-dipped, galvanized, cold-rolled, low-carbon steel.
2. Unless otherwise shown on the Drawings, posts shall be of round pipe with one end bevel-cut.
3. Ensure that the thickness of metal, cross section dimensions, and length of posts conforms to the details indicated on the Drawings for the various sizes of signs.

E. Hardware

1. Use hardware for attaching signs to sign posts consisting of round-head, galvanized, 1/4 inch hexhead bolts, fiber or asbestos washers, and galvanized steel stiffener plates.
2. Use the number of bolts recommended by the sign manufacturer.

2.04 PAVEMENT PAINTS

- A. Deliver materials to site in unopened original containers.
- B. Ensure that the paints used in work display the designated name, formula or specifications number, batch number, color, date of manufacture, and manufacturer's directions on the can or box.

- C. Paints shall conform to Federal Specifications FS TT-P-115E, TT-B-1325A, and TT-P-85E.
- D. Do not use reflectorized pre-mixed and or job-mixed paint.

3.01 GUIDE POSTS AND CULVERT MARKERS

- A. Space the guide posts and culvert markers, erect in a manner indicated on the drawings, and set plumb.
- B. When soil conditions permit, drive metal posts in place. Do not damage the posts.
- C. Install metal targets after the posts have been set in place.
- D. Give all areas where paint has been damaged a spot coat of paint. Clean or repaint all exposed areas that have become soiled.

3.02 ROADWAY SIGNS

- A. Set permanent signs in 3,000 pounds per square inch (psi) concrete to the depth indicated on the drawings.
- B. Temporary signs, required during road construction operations, may be driven in place if the driving method does not damage the posts.
- C. Install signs after sign posts are in place.

3.03 PAVEMENT STRIPING AND MARKING

- A. Preparation
 - 1. Thoroughly clean the surface to be painted by sweeping or blowing to remove all dirt and loose material which would reduce the bond between the paint and the pavement.
- B. Weather limitations
 - 1. Perform painting and marking only when the surface is dry and clean and when the ambient temperature is above 40 degrees F.
- C. Equipment
 - 1. Use only a paint striping machine which is approved by the DOE/COR.

D. Application

1. Apply a 4 inch wide yellow center line in 15 foot segments with 25 foot gaps.
 - a. Paint "no-passing" lines yellow, 4 inches wide, and continuous.
 - b. Where double "no-passing" lines are required, omit the dashed center line.
 - c. The two "no-passing" lines shall be spaced 3 inches from each other.
2. Provide white, 4 inch wide, continuous, pavement edge lines.
 - a. Place as near the edge of the asphalt road surfaces as practical.
 - b. Follow existing lines where still visible.
3. All lines shall be clean and sharp.
 - a. Avoid ragged ends of segments, fogginess along the sides, or objectionable drizzling along the unpainted portions of the strip.
 - b. Ensure that the finished products have an opaque, well-painted appearance with no black or other discolorations showing through.
 - c. Obliterate all smears with black traffic-grade paint or remove and repaint to the satisfaction of the DOE/COR.
 - d. Take all reasonable precautions to protect the paint during drying time. Paint out all objectionable tracking or remove and repaint.
4. Apply paint at its original consistency without the addition of thinners.
5. Provide air shields on the spray nozzle to eliminate paint splatter outside the limit lines.
6. Apply paint at the rate of 6.6 to 8 gallons per mile for broken zones and 17.6 to 22 gallons per mile for solid zones or as directed by the DOE/COR.

3.04 MAINTAINING TRAFFIC

- A. Permit traffic to pass through the work zones only under specific control.
- B. The Contractor is responsible for all traffic control.
- C. Provide, install, and maintain all necessary signs, lights, flares, barricades, flagmen, and other facilities for directing the safe movement of traffic through the work.

3.05 DEFECTIVE WORKMANSHIP OR MATERIAL

- A. Correct all material not conforming to the requirements of the specifications or plans delivered to the project or incorporated in the work.
- B. Correct any defective or inferior quality work as directed by the DOE/COR.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02730

TITLE: SANITARY SEWERS

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SECTION 02730

SANITARY SEWERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Sanitary sewers

1.02 RELATED WORK

A. Section 02225 - Trenching

B. Section 02556 - Water Lines

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

ASTM C428 Asbestos Cement Nonpressure Sewer Pipe

ASTM C700 Vitrified Clay Pipe, Extra Strength,
Standard Strength, and Perforated

ASTM D2729 Polyvinyl Chloride (PVC) Sewer Pipe and
Fittings

B. Federal Specifications (FS):

FS SS-P-331 Pipe, Sewer, Nonpressure, Asbestos
Cement; Couplings and Fittings

FS SS-P-361 Pipe and Fittings, Clay (Sewer)

FS SS-P-371 Pipe, Concrete (Nonreinforced, Sewer,
Storm Drain, and Culvert)

FS SS-P-375 Pipe, Concrete (Reinforced, Sewer,
Storm Drain, and Culvert)

FS WW-P-401 Pipe and Pipe Fittings, Cast Iron, Soil

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Johns Manville
- B. Certainteed
- C. Tyler
- D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

- A. Vitrified clay pipe (VCP) shall conform to ASTM C700; fittings shall conform to FS SS-P-361.
- B. Polyvinyl chloride (PVC) pipe and fittings shall conform to ASTM D2729.
- C. Cast iron pipe and fittings shall conform to FS WW-P-401.
- D. Asbestos cement pipe (ACP) shall conform to ASTM C428; fittings shall conform to FS SS-P-331.
- E. Reinforced concrete pipe (RCP) shall conform to FS SS-P-375.
- F. Precast manholes shall be manufactured with standard concrete rings.
 - 1. Wall thicknesses shall be not less than 4 inches for vertical wall sections and not less than 4 3/4 inches for cone sections.
 - 2. Rings shall be reinforced with not less than 0.12 square inch of steel per foot of wall height.
 - 3. Cast iron frames and covers for manholes shall have a minimum clear opening of 24 inches.
 - a. A plainly visible letter "S" shall be cast into all covers, at least 1 3/4 inches by 2 inches.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

- A. Remove soil and clear area under pipe connection so as to give uniform axial support to the pipe.

- B. Lay pipe to grade with the spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of the flow.
- C. Lay each pipe accurately to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.
- D. As the work progresses, clear the interior of the sewer of all dirt and superfluous materials.
- E. Where cleaning after laying is difficult because of small pipe size, keep suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.
- F. If the maximum width of the trench at the top of the pipe specified in Section 02225 is exceeded for any reason other than by direction of the DOE/COR, install such concrete cradling, pipe encasement, or other bedding as may be required to satisfactorily support the added load of the backfill.
- G. Keep trenches free from water until the pipe jointing material has set.
- H. Do not lay pipe when the weather is unsuitable or the condition of the trench is unsuitable for such work.
- I. At times when such work is not in progress, securely close open ends of pipe and fittings so that no trench water, earth, or other substance will enter the pipe or fitting.

3.02 JOINTING

- A. Plastic joint sealer
 - 1. Mold plastic joint sealer in the annular space or on the spigot of the pipe or both locations. Mold in a plant specially equipped for this purpose.
 - 2. Plastic will be acceptable only when used with clay pipe.
- B. Rubber gaskets
 - 1. Configure the gasket according to instructions of the pipe manufacturer for the particular type of pipe joint.
 - 2. Install the gasket so as to provide a tight fit.

3. Rubber gaskets may be used with asbestos cement pipe, clay pipe, polyvinyl chloride pipe, concrete pipe, and ductile iron soil pipe.

C. Do not use cement mortar as a pipe jointing material except as specified for installing wye branches in existing sewer lines of bell and spigot pipe.

3.03 CONCRETE CRADLES AND ENCASEMENTS

A. Support the pipe on a concrete cradle or encase in concrete where indicated on drawings.

1. Make a concrete mix of 1 part Portland cement, 2 1/2 parts sand, and 5 parts gravel. Use just enough water to produce a workable consistency.

3.04 WYE BRANCHES

A. Install commercially manufactured wye branches where sewer connections are indicated.

B. Do not cut into pipe for connections except when approved by the DOE/COR.

C. Use wye branches for asbestos cement pipe made of asbestos cement of the same quality as the pipe or special cast iron wye branches furnished for the purpose by the pipe manufacturer.

D. When conditions are such that the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase the pipe in concrete or support on a concrete cradle as shown on the drawings or as directed by the DOE/COR.

E. Install wye branches in an existing sewer of bell and spigot pipe by removing one pipe section, breaking off the upper halves of the next lower section and of the section to be installed, and inserting and rotating the new section so that the unbroken half of its bell will be at the bottom.

F. Complete the 2 joints with joint packing and cement mortar.

3.05 CONNECTIONS TO EXISTING MANHOLES

A. Make pipe connection to existing manholes so that the finished work will conform as nearly as practicable to the requirements specified for new manholes, including all necessary concrete work, cutting, and shaping.

3.06 SURFACE CLEANOUTS

- A. Construct the cleanout riser of 6 inch ductile iron or vitrified clay pipe and fittings using two 1/8 bends.
- B. Terminate the riser with a heavy-duty cast iron cleanout with adjustable housing and bronze plug or accepted equal.
- C. Encase the cleanout in an 18 inch x 18 inch x 6 inch thick, 2,500 pounds per square inch (psi) minimum concrete pad.
- D. Mount cleanout cover flush with top of concrete.

3.07 SOIL, WASTE, AND DRAIN PIPING

- A. Lay horizontal soil and waste pipes on a grade of 1/4 inch per foot unless otherwise indicated on the drawings or approved by the DOE/COR, but in no case less than 1/8 inch per foot (1.04%).
- B. Use reducing fittings or recessed reducers to achieve changes in pipe size on soil, waste, and drain lines.
 1. Make changes in direction with manholes or the appropriate use of 45 degree wyes; half wyes; long-sweep 1/4 bends; and 1/6, 1/8, or 1/16 bends.
 2. Use short 1/4 bends or elbows in soil and waste lines where the change in direction of flow is from the horizontal to the vertical.

3.08 MANHOLES

A. General

1. Construct manholes of precast, reinforced concrete rings with cast iron covers as shown on the Drawings.
2. Provide smooth and semicircular invert channels conforming to the inside of the adjacent sewer section.
3. Make changes in direction of flow with a smooth curve, having a radius as large as permitted by the size of the manhole.
4. Form the invert channels directly in the concrete of the manhole base.

B. Standard manholes

1. Construct base and invert channel of concrete cast in the field to suit the design.
2. Concrete shall develop a compressive strength of not less than 3,000 psi at 28 days and shall be composed of the aggregates specified under Division 3.
3. Make joints between precast rings full bedded in cement mortar and smoothed to a uniform surface on both the interior and exterior of the manhole.

3.09 SERVICE CONNECTIONS

- A. Where a building service is not installed, terminate the service approximately 5 feet from the site of the proposed building at a designated point and mark by means of a stake at grade.
- B. Close such service line with a suitable plug.
- C. If a building service is installed, make the connection thereto.

3.10 ABANDONED SEWERS AND SEWAGE DISPOSAL FACILITIES

- A. Remove the sewage from every cesspool, septic tank, and seepage pit which has been discontinued from further use and completely fill with earth, sand, gravel, or concrete.
 1. Remove the top cover or arch over the structure before filling.
 2. Do not extend the fill above the top of the vertical portions of the side walls or above the level of any outlet pipe until the structure has been inspected.
 3. After such inspection, fill the structure to the existing ground level.

3.11 BRACING

- A. Provide all necessary sheeting, bracing, and support of trench sidewalls and other excavations.
- B. Ensure workman safety by bracing to prevent caving, sliding, or collapse of sidewalls.
- C. Remove all bracing after use.

3.12 BEDDING MATERIAL

- A. Place and compact a 6 inch thick layer of sand or a mixture of sand and graded gravel in the bottom of the trench.
- B. Maximum size of gravel shall be 3/4 inches in its largest dimension.

3.13 TESTING

- A. Test for displacement of sewers
 - 1. Check sewer mains to determine whether any displacement of the pipe has occurred after the trench has been backfilled to 2 feet above the pipe and tamped as specified.
 - 2. Flash a light between manholes or, where the manholes have not yet been constructed, between the locations of the manholes. Use a flashlight or reflect sunlight with a mirror.
 - 3. Where the illuminated interior of the pipeline shows poor alignment or other defects, correct the defects and reinspect prior to continuation of backfill operations.
- B. Exfiltration
 - 1. Perform exfiltration tests on all lines.
 - 2. Restrict the maximum internal pressure in any part of the system under exfiltration test to 5 psi.
 - 3. Measure the amount of water required to maintain the pipe full for a test period of 4 hours and determine the rate of leakage.
 - 4. The allowable leakage is 20 gallons per inch of pipe diameter per 1,000 feet per hour.
 - 5. When leakage exceeds the maximum allowed, make satisfactory corrections.
 - 6. Regardless of the amount of leakage, repair all detectable leaks.
- C. Remove all defective pipe from the work and replace with sound, undamaged pipe.

D. Final tests

1. Make final tests and obtain approval of the DOE/COR prior to connection to existing main.
 - a. Seal the lowest end of each section to be tested.
 - b. Fill the pipe with water to the point of overflow at the upper end.
2. Allow the water to remain for at least 12 hours to allow for absorption. At the end of that period add makeup water and begin the test period.
3. The final test shall be for a period of 4 hours.
4. When leakage exceeds the maximum amount specified in Paragraph 3.13.B, inspect joints in the lines and repair all detectable leaks.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02731

TITLE: SEWAGE DISPOSAL SYSTEMS

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SECTION 02731

SEWAGE DISPOSAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Septic tanks
- B. Leaching systems

1.02 RELATED WORK

- A. Section 02225 - Trenching

1.03 REFERENCES

Not used

1.04 SUBMITTALS

Not used

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 SEPTIC TANKS

- A. Pre-cast concrete septic tanks and tank covers shall be built of concrete that has reached a minimum compressive strength of 3,000 pounds per square inch (psi) at 28 days.
- B. Reinforce all precast tanks and covers.
- C. Provide septic tank covers designed to support an earth load of not less than 300 pounds per square foot unless otherwise shown on the drawings.
- D. Steel septic tanks shall have a minimum 12 gauge wall thickness. Protect each such tank from corrosion both externally and internally with an approved bituminous coating or other means approved by the Department of Energy Contracting Officers Representative (DOE/COR).

2.02 GREASE AND WASTE INTERCEPTORS

- A. Provide grease and waste interceptors with a removable cover for ease of skimming off the collected grease.

PART 3 EXECUTION

3.01 SEPTIC TANKS

- A. Design septic tanks to produce a clarified effluent consistent with accepted standards and to contain adequate space for sludge and scum accumulations.
- B. Provide a minimum of 2 compartments for each septic tank.
 - 1. Construct the inlet compartment of any septic tank to be not less than $\frac{2}{3}$ of the total capacity of the tank nor less than 500 gallons liquid capacity and to be not less than 3 feet nor more than 5 feet in length.
 - 2. Provide not less than 4 feet nor more than 5 feet liquid depth.
 - 3. Size the secondary compartment of any septic tank to have a minimum capacity of 250 gallons and a maximum capacity of $\frac{1}{3}$ of the total capacity of such tank.
 - 4. In septic tanks having over 1,500 gallons capacity, limit the secondary compartment to not less than 5 feet in length.
- C. Provide access to each septic tank by at least two manholes of 20 inches minimum dimension or by an equivalent removable cover slab.
 - 1. When 2 manholes are provided, one access manhole shall be located over the inlet and one over the outlet.
 - 2. Where 3 manholes are provided, locate the third over the baffle wall.
- D. Extend the inlet and outlet pipe or baffle a distance above the liquid line equal to 20% of the liquid depth and extend a distance below the liquid line equal to 40% of the liquid depth.
- E. Provide a total depth not less than 9 inches greater than liquid depth and a cover of the septic tank which is at least 2 inches above the back vent openings.

F. Construct the partitions or baffles between compartments of same material as the tank and extend 4 inches above the liquid level.

1. Install an inverted fitting equivalent in size to the tank inlet, but in no case less than 4 inches in size, in the inlet compartment side of the baffle and place the bottom of the fitting $1/2$ the depth of the liquid.

G. Protect all concrete septic tanks from corrosion by coating the inside with an approved bituminous coating or by other means acceptable to the DOE/COR.

1. Extend the coating to at least 4 inches below the water line.
2. Cover all of the internal area above that point.

3.02 LEACHING SYSTEMS

A. Leaching trenches

1. Construct leaching trenches to the dimensions indicated on the drawings.
2. Excavate in conformance to Section 02225.
3. Construct distribution lines of unglazed clay tile; 4 inch, perforated, distribution pipe; or other approved material.
4. Lay the distribution lines in 12 to 18 inches of $3/4$ to 1 $1/2$ inch washed coarse gravel with at least 6 inches of gravel below the lines.
5. Cover the lines and gravel with untreated building paper and backfill with a minimum of 6 inches of clean cover material.
6. Provide trenches a minimum of 12 inches wide with the maximum depth from the invert of the distribution to finished grade no more than 24 inches.
7. Construct the grade of field to be 2.50 inches per 100 feet minimum, 6.00 inches per 100 feet maximum.

B. Leaching beds

1. Where leaching beds are permitted in lieu of trenches due to the unavailability of adequate installation conditions, size the area of each such bed to be at least 50% greater than the requirements for trenches.
2. Space distribution drain lines in leaching beds no more than 6 feet apart on centers.
3. Construct the perimeter of the leaching bed no more than 3 feet from a distribution line.
4. Construct all other disposal field features to be the same as required for leaching trenches.
5. Fill lateral trenches first with 3/4 to 2 1/2 inch coarse gravel aggregate. Lay unglazed clay tile or a 4 inch perforated distribution pipe in the gravel.
 - a. If tile is selected, install a 1 inch x 4 inch redwood board under the distribution system.
 - b. Follow the requirements for Paragraph 3.02.A for burial and grade of individual pipes.

3.03 DISTRIBUTION BOXES

- A. Provide distribution boxes of precast concrete when more than one distribution line is used or field construct as indicated on the drawings.
- B. The size of the box and number of outlets shall be as indicated on the drawings.
- C. Construct distribution boxes in conformance with the details shown on the drawing and Division 3.

3.04 GREASE AND WASTE INTERCEPTORS

- A. Install grease and waste interceptors where required and where shown on the drawings.
- B. Do not connect food waste-disposal units to nor allow discharge into any grease and waste interceptor.

3.05 INTENTIONALLY LEFT BLANK

3.06 ABANDONED FACILITIES

- A. Remove the sewage from every cesspool, septic tank, and seepage pit which has been discontinued from further use.
- B. Fill as specified in Section 02730.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02740

TITLE: PACKAGE SEWER LIFT STATION

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2.01	Pumping Unit

- PART 3 EXECUTION
- 3.01 Treatment and Painting

 - 3.02 Installation

 - 3.03 Manufacturers Recommendations

 - 3.04 Piping

 - 3.05 Testing

DIVISION 2
SITE WORK
SECTION: 02770
TITLE: STORAGE LINERS

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PART 1

GENERAL

1.01 Work Included

1.02 Related Work

1.03 References

1.04 Submittals

1.05 Quality Assurance

PART 2

PRODUCTS

2.01 Materials

2.02 Miscellaneous Materials

PART 3 EXECUTION

3.01 Installation

3.02 Protection

3.03 Field Quality Assurance

DIVISION 2
SITE WORK
SECTION: 02831
TITLE: FENCES

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SECTION 02831

FENCES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Chain link fences
- B. Barbed wire fencing
- C. Gates

1.02 RELATED WORK

Not used

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

- | | |
|-----------|--|
| ASTM A53 | Standard Specification for Pipe, Steel Black and Hot-Dipped, Zinc-Coated Welded and Seamless |
| ASTM A121 | Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire. |
| ASTM A123 | Zinc (Hot-Galvanized) Coatings on Iron and Steel Products |
| ASTM A384 | Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies. |
| ASTM A385 | Providing High-Quality Zinc Coatings (Hot-Dip) |
| ASTM A386 | Zinc Coating (Hot-Dip) on Assembled Steel Products |
| ASTM A392 | Zinc Coated Steel Chain-Link Fence Fabric |

B. Federal Specifications (FS):

- | | |
|-------------|-------------------------------------|
| FS RR-F-183 | Fence Posts, Gates, and Accessories |
|-------------|-------------------------------------|

- FS RR-F-221 Fencing Wire (Barbed Wire, Woven Wire, and Netting) Fence Posts and Accessories
- FS RR-F-00191 Fencing, Wire and Post, Metal (and Gates, Chain-Link Fabric, and Accessories)

1.04 SUBMITTALS

Not used

1.05 QUALITY CONTROL

Not used

PART 2 PRODUCTS

2.01 CHAIN LINK FENCE

A. Fabric

1. Provide fabric for chain link fence conforming to ASTM A392, 9 gauge steel wire woven into a 2 inch mesh and hot galvanized after weaving per ASTM A123, ASTM A384, ASTM A385 and ASTM A386.
2. Ensure that the top and bottom selvages have a twisted, barbed finish.

B. Posts, rails, gates, and accessories

1. Provide zinc-coated posts, rails, gates, and accessories which conform to FS RR-F-183.
2. Provide sizes as specified below:

	Type	Min. Size (in.)	Min. Wt. (lb/l.f.)
End & corner posts	Pipe	2.875 o.d.	5.79
Line posts	Pipe	2.375 o.d.	3.65
	"H" Sec	1.9 x 2.25	4.1
Braces and top rails	Pipe	1.66 o.d.	2.27
Truss rods	Rod	0.375 o.d.	
Gate frame	Pipe	1.9 o.d.	2.72

Gate Width (single gate or one leaf of double gate)	Gate Post Minimum Size (inches)	Min. Weight (lb/l.f.)
6 ft and less	2.875 o.d.	5.79
Over 6 ft to 13 ft	4.0 o.d.	9.11
Over 13 ft to 18 ft	6.625 o.d.	18.97

C. Top and bottom reinforcing wire

1. Provide top and bottom reinforcing wire for wire-mesh fencing conforming to FS RR-F-00191.
2. Gauge shall not be lighter than that indicated on the Drawings.

D. Tie wire

1. Provide tie wire for attaching wire-mesh fabric to posts, rails, top-and-bottom reinforcing wires, and gates conforming to FS RR-F-00191 or RR-F-221 as applicable.

2.02 BARBED WIRE FENCE

- A. Wire: furnish barbed wire consisting of two twisted strands of 12 1/2 gauge wire, with 2 point barbs spaced not more than 4 inches apart conforming to ASTM A121.
- B. Posts: furnish drive-type posts for barbed wire fencing of the length shown on the Drawings.

2.03 CONCRETE

- A. Furnish concrete having a compressive strength of 3,000 pounds per square inch (psi) at 28 days as specified in Section 03001.

PART 3 EXECUTION

3.01 GENERAL

A. Grading

1. The ground along the fence line shall be graded and compacted so that the vertical clearance between bottom of fence fabric and ground will not exceed 2 inches unless otherwise shown on the Drawings or approved by the Department of Energy Contracting Officers Representative (DOE/COR).

B. Excavation

1. Excavation for posts and other concrete-embedded items in other than bedrock shall be of the dimensions indicated on the Drawings.
2. If bedrock is encountered before reaching the required depth, the excavation shall be continued to the depth indicated or 18 inches into the bedrock, whichever is less, and shall be a minimum of 10 inches in diameter.

3. Waste material from excavation shall be spread where directed.
4. Post holes shall be thoroughly cleared of loose material.

C. Footings

1. Extend all line, corner, and end posts into the ground a minimum of 4 feet and set centrally in a concrete encasement a minimum of 10 inches in diameter from below the bottom to the finish grade.
2. Larger diameters and depths shall be as shown on the Drawings.
3. Finish concrete footings by neatly shaping at the finish grade line to provide shedding of water away from the posts.

3.02 SECURITY FENCING

A. Erection

1. Assemble and erect fences as specified and in accordance with detailed instructions furnished by the fence manufacturer.
2. Where necessary, adjust the grade of the fence to fit the contour of the ground by slipping the links in the fence fabric.
 - a. Do not slip links for excessively steep grades.
 - b. Cut fabric to fit each transition section and fasten the ends of the transition to posts by means of stretcher bars.
- B. Mount fence fabric on the side of posts and bracing away from the area being protected. Place the bottom of fabric at or below grade.
- C. Pass a 1 1/4 inch diameter top rail through the bases of the extension arms and form a continuous brace from end to end of each stretch of fence.
 1. Provide rails with expansion rail couplings at 100 foot maximum intervals and securely fasten to terminal post by means of galvanized connections.
- D. Tighten the fence fabric to within 100 pounds of the maximum tension specified by the fence manufacturer.

- E. Secure the bottom of the fabric to a tension wire at a minimum of two places between posts. Attach the tension wire to each post.

F. Gates

1. Install gates of the swing type hinged to swing through 180 degrees from closed to open complete with latches, stops, keepers, hinges, fabric, and braces.
2. Install extension arms for three strands of barbed wire above the fabric to match adjoining fence.
3. Construct gate frames of tubular members of sizes specified in Paragraph 2.01.B. Furnish gate leaves with intermediate members and diagonal truss rods to provide rigid construction free from sag or twist.
4. Make all joints between tubular members by welding or by means of heavy screwed fittings. Ensure that connections are rigid and weathertight.
5. Provide plunger bars with top, bottom, and middle locking points with the middle point arranged for padlocking.
6. Attach fabric to the gate frame ends by the use of bolt hooks, stretcher-bar bands and stretcher bars, or other methods.
 - a. Do not weld the fabric to the frame.
 - b. Attach the top and bottom of the fabric with standard wire clips at intervals not exceeding 12 inches on center.

G. Bracing

1. Brace all end, corner, and angle posts by means of 1 5/8 inch pipe set in horizontal position with adjustable diagonal 3/4 inch diameter truss braces between terminal and first line posts complete with galvanized fitting meeting ASTM A53 Type S, Grade B.
2. Provide diagonal braces which are hot galvanized 3/8 inch steel rod complete with turnbuckles.

H. Extension arms

1. Install extension arms on all posts.

- a. Attach to each arm three strands of barbed wire at an angle of 45 degrees. The upper strand shall be located 12 inches out from the fence line and 12 inches above the top of the fabric.
- b. Provide clips or wire fasteners to hold barbed wire in place.
2. Make extension arms installed on intermediate posts of galvanized, pressed, copper-bearing steel.
3. Make extension arms installed on end and corner posts of heavily galvanized malleable iron.

I. Tension bars

1. Attach the chain-link fabric to terminal posts with 3/4 inch x 1/4 inch, galvanized, high-carbon, flat steel bars secured to the posts by means of galvanized fittings.

J. Fabric ties

1. Fasten fence fabric to line posts with galvanized 9 gauge tie wires, spaced 12 inches apart.
2. Fasten fence fabric to the top rail with galvanized steel tie wires, spaced 24 inches apart.

K. Ditch closures

1. Ditches or other unavoidable depressions shall require security closures unless otherwise shown on the drawings.
 - a. Set a welded grid of Number 6 rebar 6 inches center-to-center each way.
 - b. Grid shall be 3 inches deep in a 6 inch thick x 2 1/2 foot wide concrete apron, centered on the fence line.
 - c. Place grid between line posts.
 - d. Fasten the upper end to the bottom tie wire and fence fabric.

3.03 CHAIN LINK FENCE

- A. Construct chain link fences identical to the security fence except for the omission of three strands of barbed wire and extension arms.

3.04 BARBED WIRE FENCING

A. Drive posts

1. Drive posts shall be spaced as indicated on the Drawings and driven to the depth required to provide the fence height indicated.

B. Barbed wire

1. Barbed wire shall be spaced as indicated to provide the number of strands shown on the Drawings.
2. Barbed wire shall be fastened as required by the type of post to be used in the work.

C. Gates

1. Gates shall be of the design indicated on the Drawings.
2. Security gate hinges shall have tight, nonremovable pins; latches shall be provided with means for padlocking.

3.05 GROUNDING

- A. Security fences, fences enclosing explosive storage areas, and fences enclosing electrical substations shall be grounded in accordance with the NTS Power Standards.

3.06 SIGNS

- A. All signs to be installed on a fence shall be the size and type shown on the Drawings.
- B. Size, type, and color of letters shall be as indicated.

3.07 TESTING

- A. Limit the deflection of fabric to 1 inch or less when fence-panel fabric is subjected to a 50 pound horizontal pull at midpanel, 4 feet down from the top rail.
- B. Tests shall be conducted by the Contractor in the presence of the DOE/COR prior to acceptance.

END OF SECTION

DIVISION 2

SITE WORK

SECTION: 02990

TITLE: FIRE PROTECTION SYSTEMS - WATER

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PART 1

GENERAL

1.01 Work Included

1.02 Related Work

1.03 References

1.04 Submittals

1.05 Quality Assurance

PART 2

PRODUCTS

2.01 Pipe and Fittings

2.02 Meters

2.03 Valves

2.04 Accessories

PART 3 EXECUTION

3.01 Installation of Pipe and Fittings

3.02 Installation of Meters

3.03 Installation of Valves

3.04 Installation of Fire Hydrants

3.05 Installation of Accessories

3.06 Cleaning

3.07 Testing

3.08 Disinfection

DIVISION 3
CONCRETE

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DIVISION 3

CONCRETE

SECTION: 03001

TITLE: PLAIN AND REINFORCED CONCRETE

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- ASTM C150 Portland Cement
- ASTM C260 Air Entraining Admixtures for Concrete
- ASTM C309 Liquid Membrane-Forming Compounds for
Curing Concrete
- ASTM C494 Chemical Admixtures for Concrete
- ASTM D1751 Preformed Expansion Joint Fillers for
Concrete Paving and Structural
Construction
- ASTM D2103 Polyethylene Film and Sheeting
- C. American Welding Society (AWS):
 - AWS D1.4 Structural Welding Code for Reinforcing
Steel
- D. Concrete Reinforcing Steel Institute (CRSI):
 - CRSI MAN Manual of Standard Practice
 - CRSI 63 Recommended Practice for Placing
Reinforcing Bars
 - CRSI 65 Recommended Practice for Placing Bar
Supports, Specifications and
Nomenclature

1.04 SUBMITTALS

- A. Submit product data and shop drawings for reinforcing steel. See Section 01300.
 - 1. Indicate reinforcement sizes, spacings, locations, and quantities of reinforcing steel and wire fabric; bending and cutting schedules; splicing; and supporting and spacing devices.
 - 2. Submit mill-test certificates for reinforcing steel, including physical and chemical analysis.
- B. Submit formwork details, dimensions, materials, and arrangements of joints and ties as required by the Department of Energy Contracting Officers Representative (DOE/COR).
- C. Submit proposed mix designs for each class of concrete to the DOE/COR for review prior to commencement of work.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Maintain a copy of ACI 301 on site.
- C. Verify site preparation and ensure native-soil compaction to 95% modified Proctor density. See Section 02223.
- D. Coordinate the work of all trades to install embedded items.
 - 1. Suitable instructions and templates shall be requested for setting items not placed in the forms.
 - 2. Allow no concrete placement until all embedded items have been placed, inspected, tested for mechanical function, and checked for accuracy of position and alignment.
- E. Construct formwork in accordance with ACI 301 and ACI 347.
- F. Place reinforcing steel in accordance with CRSI MAN, CRSI 63, and CRSI 65.

1.06 TESTS

- A. Testing of concrete will be performed at the direction of the DOE/COR at no cost to the Contractor. See Section 01400.
- B. Three concrete test cylinders will be made for each 100 cubic yards or fraction thereof for each class of concrete placed each day.
 - 1. One additional test cylinder will be made and cured on site during cold weather under the same conditions as the concrete it represents.
 - 2. One slump test will be made for each set of test cylinders.

1.07 CONCRETE FORMWORK

- A. Design forms and bracing so that the finished concrete conforms to shapes, lines, and dimensions shown on the Drawings.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Conform to ACI 301.
- B. Plywood: Douglas fir, solid and undamaged on one side.
- C. Lumber: Douglas fir, standard grade or better, grade stamp clearly visible.
- D. Steel: well-matched, tight-fitting, and adequately stiffened.
- E. Ties: removable or snap-off metal, adjustable length, conical ends.
- F. Store materials off ground in ventilated and protected areas to prevent damage and deterioration from moisture.

2.02 REINFORCING STEEL

- A. Deformed bars: conforming to ASTM A615.
 - 1. Bars number 3 and number 4 shall be Grade 40.
 - 2. Bars number 5 and larger shall be Grade 60.
- B. Welded-steel wire fabric: plain type conforming to ASTM A185, flat sheets, plain finish.

2.03 CONCRETE MATERIALS

- A. Use one brand and type of cement throughout project unless otherwise shown on the Drawings.
- B. Cement: conforming to ASTM C150, Type IIA, air-entraining, low-alkali; color as required.
- C. Fine and coarse aggregates: conforming to ASTM C33.
- D. Water: clean and potable.

2.04 ADMIXTURES

- A. Add an air-entraining agent, conforming to ASTM C260.

- B. Chemical admixture: conforming to ASTM C494.
 - 1. Use accelerating admixtures in cold weather only when approved by the DOE/COR.
 - 2. Use of admixtures will not relax cold weather placement requirements.
 - 3. Use calcium chloride only with written approval from the DOE/COR.
 - 4. Use retarding admixtures only when approved by the DOE/COR.

2.05 ACCESSORIES

- A. Bonding agent: polymer-resin emulsion, latex emulsion, two-component epoxy resin, or approved equal.
- B. Vapor barrier: conforming to ASTM D2103, 6 mil thick clear polyethylene film.
- C. Nonshrink grout: premixed compound with nonmetallic aggregate, cement, and water reducing and plasticizing agents; capable of minimum compressive strength of 7,000 pounds per square inch (psi) in 28 days.
- D. Flashing reglets: galvanized steel and rigid polyvinylchloride (PVC) shall be provided in longest possible lengths; alignment splines for joints; securable to formwork.
- E. Waterstops: rubber or PVC; 6 inches wide; heat-sealed joints.
- F. Form-release agent: colorless material which will not stain concrete, absorb moisture, impair natural bonding, or change color characteristics of finish coating.
- G. Chairs, bolsters, bar supports, and spacers: shaped to support reinforcement during placement of concrete; including load-bearing pads on bottoms to prevent punctures of vapor barrier.

2.06 CURING MATERIALS

- A. Water: clean and potable.
- B. Membrane curing compound: conforming to ASTM C309.
- C. Polyethylene film: conforming to ASTM D2103.

2.07 CONCRETE MIX

- A. Design concrete mix in accordance with ASTM C94.
- B. Concrete shall develop a compressive strength of 3,000 psi in 28 days unless otherwise shown on the Drawings.
- C. Add an air-entraining agent to mix for concrete exposed on the exterior of the structure.
- D. Concrete shall develop a slump not less than 2 inches nor more than 5 inches unless otherwise shown on the Drawings.

PART 3 EXECUTION

3.01 FORMWORK

- A. Verify lines, levels, and dimensions before proceeding with formwork.
- B. Coordinate work: forming openings, slots, recesses, and chases; setting sleeves, bolts, anchors, and other inserts.
- C. Construct formwork so that finished concrete conforms to shapes, lines, and dimensions shown on the Drawings.
 - 1. Provide bracing to ensure stability of formwork.
 - 2. Minimize number of joints.
 - 3. Align joints to produce a smooth finish.
 - 4. Make joints watertight to prevent leakage of mortar and disfigured surface appearance.
 - 5. Provide chamfer strips on external exposed corners.
- D. Construct formwork to maintain the following tolerances:
 - 1. Deviation from horizontal and vertical lines: 1/4 inch in 10 feet.
 - 2. Deviation from dimensions indicated on Drawings and positions of columns, walls, and partitions: 1/4 inch.
- E. When concrete is placed against undisturbed or compacted soil, hand-trim sides and bottoms and remove loose dirt prior to placing concrete.

- F. Apply form-release agent to forms in accordance with manufacturer's instructions.
 - 1. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
 - 2. Soak inside surfaces of untreated forms with clean water.
 - 3. Keep surfaces wet prior to placing concrete.
 - 4. Do not apply form-release agents where concrete surfaces will receive special finishes or applied coverings which are affected by agents.
- G. Provide temporary openings in formwork where required to facilitate cleaning and inspection.
 - 1. Locate openings at bottoms of forms to allow water to drain.
 - 2. Close temporary openings with tight-fitting panels, flush with inside faces of forms and neatly fitted so that joints will not be apparent on exposed concrete surfaces.
- H. Clean forms as construction proceeds to remove foreign matter.
 - 1. Remove debris from within forms.
 - 2. Flush with water or use compressed air to remove remaining foreign matter.
 - 3. Ensure that water and debris drain to exterior through clean-out ports.
- I. Remove forms, shores, and bracing after concrete has gained sufficient strength to carry its own weight and any subsequent construction or design load which is liable to be imposed upon it.
- J. Remove formwork in accordance with applicable safety requirements. Prevent shock loads and minimize unbalanced loads.

3.02 REINFORCEMENT

- A. Fabricate reinforcement in accordance with ACI 315, allowing for the concrete covers specified in Paragraph 3.04.K.

- B. Indicate locations of reinforcement splices on shop drawings.
 - C. Weld reinforcing bars in accordance with AWS D1.4.
 - D. Before placing concrete, clean reinforcement of rust and foreign particles or coatings.
 - E. Place, support, and secure reinforcement in place. Maintain alignment and measurements shown on the Drawings.
 - F. Protect and maintain vapor barrier.
- 3.03 ISOLATION, CONTROL, AND CONSTRUCTION JOINTS
- A. Isolation joints shall be preformed expansion filler strips conforming to ASTM D1751 and detailed as shown on the Drawings.
 - B. Control joints shall be 1/4 inch maximum wide, finished flush with surface.
 - 1. Joints may be saw cut or made with preformed insert strips.
 - 2. Depth shall be 1/4 total slab thickness unless otherwise shown on the Drawings.
 - C. Construction joints shall conform to ACI 301.
 - 1. Joints shall be of formed metal, wood, or premolded strips.
 - 2. Joints shall be located as shown on the Drawings.
 - 3. Joints may be constructed in alternate locations with the approval of the DOE/COR.
 - D. Locate all joints where shown on the Drawings or as directed by the DOE/COR.
 - E. Install waterstops in continuous lengths.
 - 1. Do not displace reinforcement.
 - 2. Heat-seal joints watertight.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Notify the DOE/COR 24 hours prior to placing concrete.
- C. Verify that anchors, seats, plates, and other items to be cast into concrete are in place and held securely.
- D. The DOE/COR will maintain records of concrete placement operations, including the date, location of placement, quantity, concrete and air temperatures, and test samples taken.
- E. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints, plumbing, and drains are not disturbed during concrete placement.
- F. Prepare previously placed concrete.
 - 1. Clean with steel brush.
 - 2. Apply bonding agent in accordance with manufacturer's instructions.
- G. Place concrete continuously between predetermined construction and control joints.
 - 1. Do not interrupt successive pours, causing cold joints.
- H. Place floor slabs in the pattern indicated on the Drawings.
- I. Maintain minimum concrete cover around reinforcing:

	Min. Cover Inches
Cast against earth	3
Exposed to earth or weather:	
Bars, number 6 through number 18.	2
Bars, number 5 and smaller.	1 1/2
Exposed to earth, not exposed to weather:	
Slabs, walls, and joists:	
Bars, number 14 and 18	1 1/2
Bars, number 11 and smaller.	3/4
Beams, girders, and columns:	
Principal reinforcement, ties, stirrups, and spirals	1 1/2

- J. Slabs on grade: compact concrete, screed, and prepare for specified finish.

1. Place concrete continuously so that each unit of operations will be monolithic in construction.
 2. Forms shall remain in place for at least 12 hours after concrete placement.
- K. Saw-cut control joints after the concrete has developed adequate strength to prevent particles of aggregate from being pulled out of the sides of the cut.
- L. Fill joints where slabs on grade abut vertical surfaces with joint filler.
1. Extend joint filler from bottom of slab to within 1/2 inch of slab surface.

3.05 FINISHING

A. Concrete floor-slab finishes:

1. Ambient temperature of spaces being finished shall be not less than 50 degrees F.
2. Finished floor-slab surfaces shall be true plane surfaces with no deviation in excess of 1/8 inch when tested with a 10 foot straightedge.
3. Dusting of finish surfaces with dry materials will not be permitted.
4. Additions of water to finish surfaces will not be permitted.
5. Monolithic finishes:
 - a. Screed and float concrete with straightedges to bring surface to required level with no coarse aggregate visible.
 - b. Float concrete while still soft to a true, even plane.
 - c. Trowel surfaces to required finish after surface moisture has disappeared, leaving no coarse aggregate visible.
 - d. Steel-trowel floor surfaces to a smooth, even, dense finish free from blemishes and trowel marks.

6. Rough finishes:
 - a. Screed with straightedge to bring surface to required plane.
 - b. Float surface to produce finish with no coarse aggregate visible.
 - c. Float surfaces which will receive ceramic tile, with full-bed setting system.
 7. Float finishes:
 - a. Screed surface with straightedge to bring surface to required plane, leaving no coarse aggregate visible.
 - b. After moisture has disappeared (finish surface with a float to an even texture).
 8. Apply nonslip finish to exterior building entrances, platforms, exterior ramps, and stair treads and landings.
 - a. Screed and float concrete to required plane, leaving no coarse aggregate visible.
 - b. Broom finish exterior surfaces.
 9. Surface tolerances for floor slabs shall conform to ACI 301.
 - a. Pitch to drains as required.
- B. Finishes on concrete other than floor slabs:
1. Remove loose material.
 2. Repair all defects.
 - a. Remove unsound concrete.
 - b. Clean out to solid concrete all tie rod and bolt holes and voids over 1/2 inch in diameter.
 - c. Brush coat with cement grout.
 - d. Fill solid with a stiff Portland cement and sand mortar mix.
 3. Patches shall be finished flush with adjoining surfaces.

- a. Cure patches for 72 hours.
 - b. Where exposed, patches shall match adjoining surfaces in texture and color.
 - c. Use white Portland cement as needed to attain color match.
4. Where smooth finish is specified on the Drawings, prepare the surface as specified in Paragraph 3.05.B.1, 2, and 3.
- a. Moisten surface thoroughly.
 - b. Brush coat with a stiff Portland cement and sand grout mix.
 - c. Match the color of the concrete. Use white Portland cement as needed to attain color match.
 - d. Float grout to fill voids. Scrape off excess with a trowel and remove visible film by rubbing with burlap.
 - e. Keep grout damp until set.

3.06 CURING

- A. Protect from moisture loss all concrete surfaces not covered by forms.
 1. Begin curing immediately after finishing.
 2. Cure for not less than seven days.
- B. Curing shall be accomplished by one of the following methods:
 1. Membrane forming:
 - a. Apply the curing compound with power-spraying equipment, complete with a fog nozzle and a wind guard.
 - b. Apply the compound in a two-coat, continuous operation. Coverage shall be not more than 200 square feet per gallon per coat.
 - c. When the DOE/COR approves application by hand sprayers, the second coat shall be applied at right angles to the first coat.

- d. The compound shall form a uniform, continuous, adherent film that will not check, crack, or peel. The film shall be free from pinholes and other imperfections.
 - e. Surfaces damaged after compound has been applied and within the curing period shall be resprayed at the rate specified above.
 - f. Curing compound shall not be used on: surfaces that are to receive bituminous membrane waterproofing, adhesive for application of other materials, concrete fill, concrete setting beds, or surfaces that are to be painted or to receive epoxy coatings.
 - g. Resin base or chlorinated rubber base curing compounds are permitted.
 - h. Permanently exposed surfaces shall be cured by use of a clear-type membrane-forming curing compound.
 - i. Shade concrete surfaces from direct sun during the curing period.
 - j. Keep surfaces free of traffic during the curing period.
2. Absorptive mats:
- a. Spread absorptive mat over slab areas.
 - b. Lap edges and ends 12 inches.
 - c. Spray with water until mat saturation.
 - d. Maintain saturation for 7 days.
3. Polyethylene film:
- a. Spread polyethylene film over slab areas.
 - b. Lap edges and ends 3 inches and seal with pressure sensitive polyester tape.
 - c. Maintain in place with plywood sheets for 7 days.

3.08 PATCHING

- A. Allow DOE/COR to inspect concrete surfaces immediately upon removal of forms.
 - 1. Patch imperfections as directed by the DOE/COR and standards of the industry.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable.

3.09 DEFECTIVE CONCRETE

- A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.
- B. Repair or replace concrete not properly placed or of the specified type.

END OF SECTION

DIVISION 4

MASONRY

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DIVISION 4

MASONRY

SECTION: 04000

TITLE: REINFORCED CONCRETE UNIT MASONRY

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SECTION 04000

REINFORCED CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Concrete masonry
- B. Reinforcement, anchorages, and accessories
- C. Parged masonry surfaces

1.02 RELATED WORK

- A. Section 01300 - Submittals
- B. Section 03001 - Plain and Reinforced Concrete

1.03 REFERENCES

A. American Concrete Institute (ACI):

ACI 315 Detailing Manual

B. American Society for Testing and Materials (ASTM):

ASTM A153 Zinc Coating (Hot-Dip) on Iron and
Steel Hardware

ASTM A615 Deformed and Plain Billet-Steel Bars
for Concrete Reinforcement

ASTM C33 Specification for Concrete Aggregates

ASTM C90 Hollow Load-Bearing Concrete Masonry
Units

ASTM C144 Specification for Aggregate for
Masonry Mortar

ASTM C150 Portland Cement

ASTM C331 Lightweight Aggregate for Concrete
Masonry Units

ASTM C404 Specification for Aggregates for
Masonry Grout

4. Testing shall be done in accordance with ASTM C426.

1.05 QUALITY ASSURANCE

Not used

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregates

1. Aggregate for masonry units: aggregate used in making concrete masonry units shall conform to ASTM C33 or ASTM C331.
2. Aggregate for masonry mortar: aggregate for masonry mortar shall conform to ASTM C144.
3. Aggregate for masonry grout: aggregate for masonry grout shall conform to ASTM C404, Table 1, fine aggregate, Size No. 2.
4. Aggregate for low-lift and high-lift grout: shall conform to ASTM C404, Table 1, coarse aggregate size number 8, except that the coarse aggregate shall be graded with 100% passing the 3/8 inch sieve and not more than 5% passing the number 8 sieve.

B. Cement: Portland cement shall conform to ASTM C150, Type IIA, low alkali.

C. Grout:

1. Grout shall conform to ASTM C476 except as specified.
2. Grout shall be classified as fine; low-lift or high-lift type.
3. The aggregate shall be as specified in Paragraph 2.01.A.
4. Grout shall attain a minimum ultimate compressive strength in 28 days of 2,000 pounds per square inch (psi).
5. When used in the Project, grout shall be mixed in the laboratory-established proportions which shall include the water content necessary to obtain the consistency required.

6. The low-lift grout mixtures shall be designed to have water content which shall give a pouring consistency with a slump of approximately 5 inches without segregation of the constituents.
7. When placement is by the high-lift method, the grout shall be mixed in the laboratory-established proportions which shall include fluidifier and water content necessary to obtain a slump of approximately 11 inches, suitable for pumping without segregation of the constituents.
8. Adjustments in the cement content shall be made to ensure that the grout meets the minimum ultimate compressive strength.
9. No change in the laboratory-established proportions shall be made nor shall materials with different physical or chemical characteristics be utilized in grout used in the construction, unless the Contractor furnishes additional evidence that such grout meets the requirements as specified and receives permission to use from the Department of Energy Contracting Officers Representative (DOE/COR).

D. Mortar:

1. Mortar shall conform to ASTM C476 except as specified.
2. The aggregate shall be as specified in Paragraph 2.01.A.
3. When tested for compressive strength, the water-retention requirements for mortar stipulated in ASTM C476 shall apply.
4. The mortar shall obtain a minimum ultimate compressive strength in 28 days of 2,000 psi.
5. When used in the Project, mortar shall be mixed in the laboratory-established proportions with water as may be necessary to produce the workability desired.
6. No change in the laboratory-established proportions shall be made nor shall materials with different physical or chemical characteristics be utilized in mortar used in the Project unless the Contractor furnishes additional evidence that such mortar meets the requirements as specified.

7. Plasticizers, accelerators, retardants, water-repellent agents, or other admixtures are not recommended for mortar.
8. Calcium chloride shall not be used.

E. Reinforcement and anchorages

1. Reinforcing steel bars number 5 and larger shall conform to ASTM A615, Grade 60; number 2, number 3 and number 4 bars shall conform to ASTM A615 Grade 40. All bars shall be deformed unless otherwise shown on the Drawings.
2. Single wythe joint reinforcement shall be truss type, galvanized-steel construction with 3/16 inch side rods and number 9 gauge cross ties.
3. Anchors and ties, where applicable, shall be as shown on the approved design drawings and, except as otherwise specified, shall be zinc-coated ferrous metal. Zinc coating of anchors and ties shall conform to ASTM A153, Class B-1, B-2, or B-3, as required.

F. Concrete masonry units

1. Concrete masonry units shall be two-core units of modular dimensions and shall include all closers, jamb units, lintels and special shapes of the required sizes to complete the Project as indicated.
 - a. Units shall conform to ASTM C90, Type I, Grade N-I.
 - b. Exposed-to-view or painted units in any one building shall be of the same appearance and shall be cured by the same process.
 - c. Units shall be free of any deleterious matter that will stain plaster or corrode metal and shall weigh not less than 105 pounds per cubic foot.

- G. Centering clips and caging devices: positive positioning devices for reinforcing bars shall conform to FS QQ-W-461, Composition 1006, 1010, or 1015, Finish 5, Class 1, hard, and shall be of standard manufacture of a design as approved by the DOE/COR.

2.02 DELIVERY, STORAGE, AND HANDLING

- A. Masonry materials shall be stored in a manner that will protect them to avoid chipping and breakage from contact with soil and exposure to the elements.
- B. Units shall be delivered to the jobsite in air-dry condition and shall conform to linear shrinkage potential tests as stipulated in ASTM C426.

PART 3 EXECUTION

3.01 ERECTION

- A. Masonry shall not be erected when the ambient temperature is below 40 degrees F except by written permission of the DOE/COR.
 - 1. No frozen work shall be built upon.
 - 2. No masonry unit having a film of water or frost on its surface shall be laid in the walls.
 - 3. Masonry shall be protected from freezing for 48 hours after being laid.
 - 4. Masonry erected during arid weather when the ambient temperature is more than 99 degrees F in the shade and the relative humidity is less than 50% shall be protected from direct exposure to wind and sun for 48 hours after installation.
 - 5. Masonry shall be laid plumb, true to line, with level courses accurately spaced, and with all courses laid with the vertical joints of one course falling midway between those of adjacent courses
 - 6. Vertical cells to be filled with grout shall have vertical alignment sufficient to maintain a clear, unobstructed, continuous vertical core.
 - 7. Each unit may be adjusted to its final position in the wall while mortar is still soft and plastic.
 - 8. Any unit which is disturbed after mortar has stiffened shall be removed and relaid with fresh mortar.
 - 9. Bond pattern shall be kept plumb throughout.
 - 10. Corners and reveals shall be plumb and true.

11. Vertical joints shall be of the same width except for inconspicuous variations required to maintain the bond pattern.
 12. The sizes of any 2 adjacent units shall be selected within permitted tolerances so that the difference between the vertical faces of such units in exposed-to-view or painted walls or partitions as installed in habitable rooms and spaces shall not exceed 1/8 inch.
 13. The controlling alignment shall be on the exterior side of exterior walls and on the corridor side of corridor walls.
 14. Units in exposed-to-view shall be free from chipped edges or other imperfections detracting from the appearance of the finished work.
- B. Wetting masonry units: concrete-masonry units shall not be wetted before laying.
- C. Protection:
1. Surfaces of masonry not being worked on shall be properly protected at all times during construction operations.
 2. At such time as rain or snow is imminent and the work is discontinued, the tops of exposed masonry walls shall be covered with a strong waterproof membrane well secured in place.
 3. Adequate provisions shall be made during construction to prevent damage from wind and freezing.
- D. Mortar:
1. Mortar that has stiffened because of chemical reaction or hydration shall not be used or retempered for use.
 2. Mortar shall be discarded if not used and placed in final position within 2 1/2 hours after mixing.
- E. Unfinished work:
1. Unfinished work shall be stepped back for jointing with new work; tothing may be resorted to only when approved by the DOE/COR.

2. Before new work is started, all loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

F. Embedded items:

1. Spaces around metal door frames and other built-in items shall be solidly filled with grout or mortar.
2. Anchors, wall plugs, accessories, reglets, flashings, and other items required to be built in with masonry shall be built in as the masonry work progresses.
3. Cutting and fitting of masonry required to accommodate the work of others shall be done by qualified craftsmen with masonry saws.
4. Anchor bolts, bearing plates, and other anchors shall be built into the walls at all points and in the manner indicated on the design or shop drawings.
5. Cells which receive anchor bolts or support bearing plates shall be reinforced as shown on the design drawings and filled solidly with grout.

G. Sills and lintels:

1. Sills and lintels shall be set with faces plumb and true in full bed of mortar except that sills with lugs shall have mortar beds under the ends of the sill only.
2. Sills shall be leveled and tapped into place on these beds.
3. Upon completion of the walls, the remainder of the bed joint shall be filled solidly with mortar from front to back, and the exterior face of the mortar tooled smooth.

H. Mortar joints:

1. Mortar joints on all exposed-to-view or painted interior walls and partition surfaces, except control joints, shall be tooled slightly concave with a device as long as practicable, so that the mortar will be thoroughly compacted and pressed against the edges of the units.
2. Tooling shall not be done until after the mortar has taken its initial set.

3. All other face joints, except control joints, shall be cut off flush and not tooled.
4. Chases and raked-out joints shall be kept free from mortar or other debris.
5. The following joints on the weather side of exterior masonry walls shall be raked out $3/4$ inch and left ready for caulking: control joints, joints between metal frames and masonry, and horizontal and vertical faces of joints where so indicated.
6. Exposed mortar-head and bed joints in masonry work shall have a thickness equal to the difference between the actual and nominal dimensions of the masonry in either height or length; but in no case shall the average width of any 3 adjacent joints vary by more than $1/8$ inch.
7. The width of all exposed mortar joints shall be approximately $3/8$ inch.

I. Control joints:

1. Control joints shall be provided in concrete-masonry construction in strict accordance with design details shown on the Drawings.
2. Control joints shall be constructed by using either special control-joint units, sash units, or open-end stretcher units at the option of the constructor, unless otherwise noted.
3. Control joints shall be provided at the locations shown on the Drawings.
4. Structural bond beams at roof level shall not be broken at control joints.
5. Dummy joints shall be formed in the continuous structural bond beams at control joint locations.
6. Control joints and dummy bond beams joint on exposed-to-view or painted interior walls shall be raked to a depth of $1/4$ inch and shall not be caulked.
7. Caulk control joints. See Section 07900.

J. Placement of reinforcing steel:

1. Bars, fabricated to the shapes and dimensions shown on the design drawings, shall be placed where indicated on the Drawings or where required to carry out the intent of the Drawings and this Specification.
 - a. When surrounding grout is placed, all reinforcements shall be free from loose, flaky rust and scale and free from oil, grease, mortar, or other coating which might destroy or reduce its bond with the grout.
 - b. Unless otherwise indicated, the details of reinforcing steel shall conform to ACI 315.
 - c. Reinforcing steel shall not be bent or straightened in a manner injurious to the steel.
 - d. Bars with kinks or bends not shown on the Drawings shall not be used.
 - e. The use of heat to bend or straighten reinforcing steel or welding of bars will be permitted only if the entire operation is approved by the DOE/COR.
 - f. Placement of reinforcement shall be inspected and approval received from the DOE/COR prior to placing grout.
2. Bars shall be lapped a minimum of 40 diameters or 2 feet, whichever is greater, or as shown on the Drawings.
 - a. Lapped ends of bar shall be placed in contact and securely wired together with 18 gauge, black, annealed wire.
 - b. Splices shall be located as shown on approved shop drawings.
 - c. Reinforcing steel shall not be spliced at points of maximum stress.
 - d. At points of critical stress, splices in adjacent bars shall be staggered.

3. Reinforcing steel shall be accurately positioned in the masonry cells and securely held in place by means of metal or concrete supports, centering clips, spacers, ties, or caging devices adequate to prevent displacement during construction.
 - a. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the grouting operation.
 - b. Dowels or bars extending from concrete shall be positioned to locate vertical wall reinforcement on proper positioning in wall, unless otherwise indicated.
 - c. Vertical bars shall be fixed in position at the top and bottom and at intermediate intervals not exceeding 160 diameters of the bar.
 - d. The minimum clear distance between parallel bars shall be not less than 1 1/2 times the diameter of the bar.
 - e. The minimum clear distance between masonry units and reinforcing bars shall be 1/4 inch.
 - f. Column and pilaster ties shall be wired in position around the vertical steel; laying ties in mortar joints will not be allowed, except where number 2 ties are used in horizontal joints.
 - g. The position of bars shall be as shown on the design drawings with the following tolerances:

Variation from transverse position	1/2 inch
Variation from longitudinal position	2 inches
Variation from vertical position	1 inch

- K. All walls and partitions shall be reinforced both vertically and horizontally.
 1. Reinforcement shall be as shown on the Drawings.
 2. When not shown, minimum vertical reinforcement shall be one number 5 bar at 32 inches on center.
 3. As part of the minimum reinforcement, vertical reinforcements shall be provided at corners, anchored intersections, and control joints.
 4. All vertical bars shall extend from floor to roof levels.

- L. Provide 2 number 5 reinforcing bars on all sides of every opening which measures 2 feet in either direction.
1. Such extra perimeter bars shall extend not less than 40 bar diameters or 24 inches, whichever is greater, beyond the corners of the opening.
 2. Where the opening exceeds 6 feet horizontally or 8 feet vertically, reinforcement shall be 2 number 5 bars and shall extend from floor to roof level.
 3. The bars required above shall be in addition to minimum reinforcement.
 4. The additional perimeter reinforcement at openings shall be located in the nearest cavity that does not contain other required reinforcement.
- M. Additional vertical reinforcement shall be installed at corners, anchored intersections, control joints, and end of wall panels.
1. Provide vertical reinforcement so that a total of at least 2 reinforced cells are adjacent to external corners, on each side of control joints, at the end of each wall panel, and at the junction of an intersected wall which is anchored to the intersecting wall.
 2. The vertical reinforcement at each location shall be 2 deformed number 5 bars and shall extend from floor to roof level.
- N. Bond and anchorage:
1. Unless otherwise indicated, each tier of masonry units shall be laid in straight, even courses with the joints in the successive course above breaking halfway between the joints of the next course below.
 2. Each course shall be masonry bonded at corners.
 3. Intersecting walls and partitions shall be anchored by continuous reinforcing bars, except where otherwise indicated.
- O. Bond beams:
1. Bond beams in grouted-core hollow unit masonry construction shall consist of bond beam units filled with grout and reinforced as indicated.

2. When open-bottom bond beam units are used, wire-mesh, small-mesh expanded-metal lath, or other approved material shall be placed in the mortar joint immediately under each bond beam course, except at vertical cores which are to be grouted, in order to cover and prevent filling of the unreinforced vertical cores below.

P. Lintels:

1. Lintels in hollow-unit masonry construction, unless otherwise indicated, shall be constructed of U-shaped units, reinforced as indicated and filled solidly with grout.
2. Lintels shall extend at least 24 inches beyond each face of the opening with open-bottom cells over reinforced vertical cells.
3. Lintels shall be of a depth equal to the wall thickness, unless otherwise indicated, but not less than 8 inches in depth.

Q. Concrete surfaces:

1. Concrete surfaces which are to receive or to be in contact with masonry shall be clean and damp.
2. Any laitance shall be removed by sandblasting if necessary.

R. Cleanout holes:

1. Cleanout holes shall be provided at the bottom of grout pours when in-place masonry exceeds 40 inches in height.
2. The spacing of openings shall not exceed the spacing of vertical reinforcement.
3. Cleanout openings shall be of sufficient size and located to allow flushing away any mortar droppings and debris and for wiring bars lapped with dowels when vertical bars are placed after masonry is laid.
4. In hollow-masonry construction, clean-out openings shall be of a 4 inches square, cut from one face shell of each reinforced vertical core, or at the option of constructor, an approved manufacturer's standard cleanout unit.

5. Where all cells are to be grouted, the cleanout course shall be constructed with open-bottom bond beam units, inverted, to permit cleaning of all cells by flushing.
 6. Cleanout holes shall not be plugged until the masonry work, reinforcement, and final cleaning of grout spaces have been approved by the DOE/COR.
 7. Cleanout holes shall be plugged with material to match the surrounding masonry.
 8. A new series of cleanouts shall be established if grouting operations are stopped for a period longer than 4 hours.
- S. Placement of grout:
1. Before commencing grouting operations, the constructor shall notify the DOE/COR.
 - a. Reinforcing bars shall be secured in position, inspected, and approved by the DOE/COR before grouting.
 - b. Grout shall be poured by hand bucket, concrete hopper, or through a grout pump in such a manner as to completely fill the grout spaces without segregation of the ingredients.
 - c. Immediately after deposit, the grout shall be thoroughly compacted by agitating in a manner approved by the DOE/COR.
 - d. Tapping or other external vibration of the masonry or reinforcement shall not be permitted.
 2. The use of belt conveyers, chutes, or other similar equipment shall not be permitted without written approval by the DOE/COR.
 - a. Grout shall be handled from mixer to transport vehicle to place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients until the approved unit of operation is completed.
 - b. Where grout is conveyed and placed by pumping, the pump shall be such that a continuous stream of grout without air pockets is produced.

- c. When pumping is completed, grout to be used remaining in pipeline shall be ejected without contamination of grout or separation of ingredients.
 - d. Each lift or pour shall be compacted by hand-spading and rodding with 1 inch X 2 inch wood-tamping poles unless otherwise directed by the DOE/COR.
 - e. Before each run, hardened grout, debris, and foreign materials shall be removed from inner surfaces of mixing and conveying equipment.
 - f. After each run, equipment shall be thoroughly cleaned. Waste material, debris, and flushing water shall be discharged outside the masonry.
3. Grout placed as laying of masonry progresses is classified as low-lift grouting.
 - a. Height of any ungrouted masonry shall not exceed 24 inches.
 - b. Grout shall be placed while mortar joints are still soft and plastic or the grout space shall be cleaned of mortar droppings and protruding mortar joints removed.
 4. Grout placed after the wall is laid higher than 24 inches is classified as high-lift grouting.
 - a. Cleanout holes shall be provided at the bottom of each grout lift.
 - b. Placement of a grout lift shall be made at such a rate that successive lifts (layers) in an individual pour unit shall be placed and consolidated while the preceding lift is still soft and plastic.
 - c. The height of grout lift shall not exceed 6 feet.
 5. The grout shall be handled from the mixer to the final place of deposit as rapidly as practicable.
 - a. Grout shall be placed and consolidated before it has stiffened because of chemical reaction or hydration.

- b. Grout not used within a time interval of 2 1/2 hours from time of water addition shall be discarded.
6. High-lift grout shall not be poured until the mortar of the masonry work has been allowed to set for a minimum of 3 days in hot weather or 5 days in cold, damp weather as determined by the DOE/COR.
 - a. Grout shall first be poured to a height of one lift and rodded to thoroughly fill all voids, spaces, and interstices.
 - b. After a waiting period, a second lift shall be poured to the same depth and all spaces again rodded.
 - c. When consolidating the upper lift, permit the tamping poles to reconsolidate and make the two lifts monolithic.
 - d. The waiting period between placement of lifts, 15 to 60 minutes, will depend upon type of construction, type of units, spacing of wall ties, height of lifts, and weather conditions.
 - e. The rate of lift placement shall be controlled within limits which will avoid either hydrostatic blowouts or formation of cold joints.
 - f. Repeat the waiting, pouring, and rodding steps until the top of the wall is reached.
 - g. The top lift shall also be reconsolidated after a waiting period.
 - h. At end of each workday, the grout shall be stopped 1 1/2 inch (+ 1/2 inch) below top of uppermost in-place masonry unit, except that the lift at the top of wall shall be carried to the top of masonry units.
 - i. Pours in columns, pilasters, grouted cores, or other vertical members shall terminate at the underside of the deepest horizontal member framing thereto.
 - j. For keying, the grout pour shall be stopped at least 1 1/2 inches below the top of the upper masonry course.

- k. Vertical members shall be poured at least 2 hours before any horizontal overhead work is placed thereon.
 - l. Grout in bond beams, lintels, and other grouted horizontal spaces shall be placed continuously so that the pour of the member will be monolithic.
 - m. At least 48 hours shall elapse between the pouring of adjoining sections.
 - n. Reinforcing bars splashed with grout shall be recleaned in advance of placing subsequent grout pours.
 - o. Placement of grout will not be permitted when the sun, heat, wind, or limitations of the facilities furnished by the Contractor prevent proper placement and curing of the grout.
7. Walls shall be braced against wind and other forces during construction.
- a. If blowouts, misalignment, or cracking of face-shells should occur during construction, the wall shall be torn down and rebuilt.
 - b. The high-lift grouting of any section of wall between lateral flow barriers shall be completed to the top in one working day unless a new series of cleanout holes are established and the resulting horizontal construction joint cleaned.
- T. Cleaning of wall surfaces:
- 1. Immediately after the grout work is completed, the exposed masonry faces shall be washed down thoroughly with a stream of water through a jet nozzle to remove any scum or stains.
 - 2. Subsequent cleaning may be necessary as the curing takes place.
- U. Curing:
- 1. Attention shall be given to proper curing of the mortar joints as well as the grout.
 - 2. The masonry work and top of grout pour shall be protected from freezing and direct exposure to drying effects of sun and wind for 48 hours after installation.

3.02 TOLERANCES

- A. Alignment of pilasters: maximum 1/4 inch from true line.
- B. Variation from unit to adjacent unit: 1/32 inch maximum.
- C. Variation from plane of wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- D. Variation from plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Variation from level coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
- F. Variation of joint thickness: 1/8 inch in 3 feet.
- G. Maximum variation from cross-sectional thickness of walls: plus or minus 1/4 inch.

3.03 CLEANING

- A. Remove excess mortar and smears.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.
- D. Use nonmetallic tools in cleaning operations.

3.04 PROTECTION

- A. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- B. Provide protection without damaging completed work.
- C. At day's end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

DIVISION 5

METALS

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05210	Steel Joists
05300	Steel Roof and Floor Decking
05400	Cold Formed Metal Framing

DIVISION 5

METALS

SECTION: 05120

TITLE: STRUCTURAL STEEL AND MISCELLANEOUS METAL

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SECTION 05120

STRUCTURAL STEEL AND MISCELLANEOUS METAL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Steel framing members
- B. Baseplates and shear stud connectors
- C. Grouting under baseplates
- D. Floor gratings and floor plating
- E. Handrails, balusters, and fittings

1.02 RELATED WORK

- A. Section 03001 - Plain and Reinforced Concrete
- B. Section 05210 - Steel Joists
- C. Section 05300 - Steel Roof and Floor Decking
- D. Section 09900 - Painting

1.03 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - AISC SPEC Specification for the Design,
Fabrication and Erection of Structural
Steel for Buildings
- B. National Association of Architectural Metal
Manufacturers (NAAMM):
 - NAAMM A202.1 Metal Bar Grating Manual for steel and
aluminum gratings and stair treads
- C. American National Standards Institute (ANSI):
 - ANSI B 46.1 Surface Texture
- D. American Society for Testing and Materials (ASTM):
 - ASTM A36 Structural Steel
 - ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-
coated Welded and Seamless

ASTM	A307	Carbon Steel Externally Threaded Standard Fasteners
ASTM	A325	High Strength Bolts for Structural Steel Joints
ASTM	A336	Zinc Coating (Hot Dip) on Assembled Steel Products
ASTM	A446	Steel Sheet, Zinc-Coated by Hot Dip Process
ASTM	A490	Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints
ASTM	A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
ASTM	A501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM	A525	General Requirements for Steel Sheet, Zinc-Coated by the Hot Dip Process
ASTM	A569	Steel, Carbon, Hot Rolled Sheet and Strip, Commercial Quality

F. American Welding Society (AWS):

AWS	A2.0	Standard Welding Symbols
AWS	D1.1	Structural Welding Code - Building Construction

G. Federal Specifications (FS):

FS	TT-P-31	Paint, Oil: Iron Oxide, Ready Mix, Red and Brown
FS	TT-P-641	Primer Coating, Zinc Dust - Zinc Oxide (for galvanized surfaces)
FS	TT-P-645	Primer, Paint: Zinc Chromate, Alkyd Type

H. Steel Structures Painting Council (SSPC).

1.04 SUBMITTALS

A. See Section 01300.

B. Shop drawings:

1. Fabrication of structural steel work shall not be started prior to the approval of shop drawings.
2. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, fasteners, connections, cambers, finishes, and accessories.
3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
4. Indicate floor plate and grating span and deflection tables, openings, tolerances and attachment details.
5. Indicate elevations, details, and piece numbers on erection drawings where applicable.

C. Prepare shop drawings under seal of a Licensed Professional Engineer experienced in design of this type of work.

D. Manufacturer's mill certificate: submit certification that products meet or exceed the specified requirements.

E. Mill test reports: submit manufacturer's certificates, indicating structural strength, destructive and nondestructive test analysis, and chemical properties.

F. Welders' certificates: submit certificates, certifying welders employed on the Project, verifying AWS qualifications within the previous 12 months.

G. Submit welding procedures specifications.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC SPEC. Welding shall conform to AWS D1.1.

B. Maintain one copy of each approved submittal document on site.

C. Necessary templates and instructions for the installation of the embedded items shall be furnished. Shop drawings which effect anchor patterns shall be approved by Department of Energy Contracting Officers Representative (DOE/COR) prior to concreting anchors in place.

- D. The design of members and connections for any portions of the structures not indicated on the Drawings shall be submitted for approval before any material is fabricated.
 - 1. Design shall conform to the requirements of the AISC SPEC and be prepared under the direct supervision of a Licensed Professional Engineer experienced in the design of this type work.
 - 2. Drawings showing such designs shall be comparable in extent of information and detail to the Project drawings.
 - 3. No changes or modifications shall be made without prior approval by the DOE/COR.
 - E. Unless otherwise indicated on the Drawings, field connections shall be bolted in accordance with the requirements of the AISC SPEC. Welded connections will be permitted only as indicated on the Drawings or as specifically authorized.
 - F. Holes shall not be made or enlarged by burning. Holes shall be provided in members to permit connecting of other work to the structure, as shown on the Drawings or approved.
 - G. Column bases shall conform to the AISC SPEC unless otherwise indicated on the Drawings.
 - H. The Fabricator shall be responsible for all errors of detailing fabrication, and for the correct fitting of the structural members.
 - I. Material shall be stored out of contact with the ground in such manner and location as will minimize contamination and deterioration.
 - J. Insofar as practicable, shop-assemble work prior to field erection and installation. Do not site-assemble unless otherwise unavoidable.
 - K. Source testing and analysis of components will be performed as directed by the DOE/COR to verify requirements of the Contract and the applicable references above.
- 1.06 WORK INSTALLED UNDER OTHER SECTIONS
- A. Furnish anchors and embedded plates to be cast in concrete or embedded in masonry systems.

1.07 FIELD MEASUREMENTS

- A. Verify that measurements on site are as shown on the Drawings prior to shop fabrication.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials including structural-steel members, steel plate, metal pipe, bolts, nuts, washers, welded metal, and other items to be used in the Project shall be of the type, grade, class and size shown on the Drawings and shall meet the requirements of the applicable references.
- B. Steel sections: ASTM A36.
- C. Steel tubing: ASTM A500 or A501.
- D. Sheet steel: ASTM A446, Grade B, structural quality with a class G90 coating.
- E. Bolts, nuts, and washers: ASTM A307, A325 or A490 as noted on the Drawings.
- F. Gratings: ANSI A202.1, type as noted on the Drawings.
- G. Welding materials: AWS D1.1; type required for materials being welded.
- H. Primer: FS TT-P-31, for shop application and field touchup.
- I. Touch-up primer for galvanized surfaces: FS TT-P-641 or FS TT-P-645.
- J. Floor plate: ASTM A569 or A36; carbon steel with raised lug pattern.
- K. Railings: handrail to be fabricated of 1 1/2 inch diameter, Schedule 40 pipe conforming to ASTM A53 or as shown on the Drawings.
- L. Dissimilar materials: Where dissimilar metals are in contact, or where aluminum is in contact with concrete or masonry, the surface shall be protected with a coat of bituminous paint or asphalt varnish.

2.02 FABRICATION

- A. Fabrication shall be in accordance with the applicable provisions of the AISC SPEC.

1. Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inches as determined by ANSI B46.1 and the ends shall be square within the tolerances for milled ends specified in ASTM A36.
 2. Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, and surfaces to be fireproofed, shall be prepared for painting in accordance with the AISC SPEC and primed with paint materials. See Section 09900.
- B. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included.
1. Poor matching of holes for fasteners shall be cause for rejection.
 2. Thickness of metal and details of assembly and supports shall give ample strength and stiffness.
- C. Fit and shop assemble sections in largest practical sizes for delivery and installation.
- D. Supply components required for secure anchorage of handrails and railings.
- E. Make exposed handrail joints butt tight together, flush, and with a hairline joint. Grind exposed handrail welds smooth and flush with adjacent surfaces.
- F. Accurately form components required for anchorage of railings to each other and to the building structure.
- G. Install continuous plastic handrail cover as shown on the Drawings. Heat-weld joints and trim smooth.
- H. Provide support framing for floor, roof, and wall openings where not shown on the Drawings.
- I. Exposed mechanical fastenings shall be flush countersunk screws or bolts unobtrusively located and consistent with design of structure, except where specifically noted otherwise.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC.
- B. Thoroughly clean surfaces of rust, scale, grease, and foreign matter prior to galvanizing.

C. Shop painting:

1. Unless otherwise specified, surfaces of ferrous metal, except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating.
2. Items to be finish painted shall not be given a bituminous protective coating.
3. Surface shall be cleaned with solvents or sandblasting to remove loose rust, loose mill scale, and other foreign substances.
4. Surfaces of items embedded in concrete shall not be painted.

- D. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A386 or ASTM A525 as applicable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and ready to receive work.
- B. Beginning of installation means Erector accepts existing conditions.

3.02 ERECTION

- A. Erection of structural steel shall be in accordance with the applicable provisions of the AISC SPEC.
 1. Driftpins may be used only to bring together the several parts. They shall not be used in such manner as to distort or damage the metal.
 2. Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work.
 3. Base plates for columns and bearing plates for beams, girders, and similar members shall be provided.
 - a. Base and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads.

- b. Separate setting plates under column base plates will not be permitted.
 - c. The area under the plate shall be damp-packed solidly with nonshrink grout. See Section 03001.
- 4. Field-welded components and shear studs shall be completed before load is applied.
 - 5. After erection: bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with the same paint as that used for the shop coat.
- B. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
 - C. Do not field cut or alter structural members without approval of the DOE/COR.
 - D. Install in accordance with shop drawings and product manufacturer's instructions.
 - E. Erect work square, plumb, level, and accurately fitted and free from distortion or defects detrimental to appearance or performance.
 - F. Anchor handrail to structure.
 - G. Weld field connections in accordance with AWS D1.1.
 - 1. Grind smooth to complete assembly.
 - 2. Touch-up welds with primer.
 - H. Replace items damaged during installation.
 - I. Mechanically cut galvanized finished surfaces. Do not use flame cutting tools.
 - J. Secure grating by welding or mechanical fasteners to prevent movement.

END OF SECTION

DIVISION 5

METALS

SECTION: 05210

TITLE: STEEL JOISTS

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SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Open-web steel joists
- B. Bearing plates and anchor bolts
- C. Framed small openings in floor and roof

1.02 RELATED WORK

- A. Section 03001 - Plain and Reinforced Concrete
- B. Section 05120 - Structural Steel and Miscellaneous Metal
- C. Section 05300 - Steel Roof and Floor Decking
- D. Section 09900 - Painting

1.03 REFERENCES

- A. American Welding Society (AWS):
AWS D1.1 Structural Welding Code
- B. Steel Joist Institute (SJI):
SJI SPEC Standard Specifications for Open Web
Steel Joists
- C. Structural Steel Painting Council (SSPC).

1.04 SUBMITTALS

- A. Submit shop drawings and product data. See Section 01300.
- B. Shop drawings:
 - 1. Fabrication of structural-steel work shall not be started prior to the approval of shop drawings.

2. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist-leg extensions, joist coding, bridging, connections, attachments, and cambers.
3. Design connections not detailed on the Drawings under direct supervision of a Licensed Professional Engineer experienced in design of this type work.

- C. Welders' certificates: submit manufacturer's certification that welders employed on this project have met AWS verification within the previous 12 months.
- D. Copies of certificates of compliance stating that the steel joists have been designed and manufactured in accordance with the SJI SPEC shall be submitted for approval. Complete engineering design computations may be submitted in lieu of the certification.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SJI SPEC and load and weight tables.
- B. Steel joists shall be designated on the Drawings with the standard designations of SJI.
 1. Joists of other standard designations or joists with properties other than those shown may be substituted for the joists designated, provided that the structural properties are equal to or greater than those of the joists shown, that the units will fit the space provided without requiring revision to the adjacent materials or systems, and that all other specified requirements are met.
- C. Maintain one copy of each approved submittal document on site.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. See Section 01600 and SJI SPEC.
- B. Store and protect products. See Section 01600 and SJI SPEC.
- C. Protect joists from distortion and damage.

1.07 FIELD MEASUREMENTS

- A. Verify measurements on site are as shown on design drawings prior to shop fabrication.

PART 2 PRODUCTS

2.01 OPEN WEB STEEL JOISTS

- A. Open-web steel joists shall conform to SJI SPEC. Joists shall be designed to support the loads given in the standard load table.

2.02 ACCESSORIES AND FITTINGS

- A. Accessories and fittings, including end supports and bridging, shall be in accordance with the standard specifications under which the members were designed.

2.03 FABRICATION

- A. Provide bottom and top joist chord extensions as indicated on the Drawings.
- B. Frame special-sized openings in joist chord framing as shown on the Drawings.

2.04 FINISH

- A. Shop-prime joists.
 - 1. Finish all component surfaces in accordance with SSPC SPEC.
 - 2. Do not prime surfaces that will be fire proofed, field welded, or in contact with concrete.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means Erector accepts existing conditions.

3.02 ERECTION

- A. Erect and bear joists on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.

- C. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates or angles.
- D. After joist alignment and installation of framing, field weld joist seat to bearing plates or angles.
- E. Position and field-weld joist chord extensions and wall attachments as detailed.
- F. Frame floor or roof openings with supplementary framing.
- G. Do not permit erection of decking until joists are braced, bridged, and secured.
- H. Do not field cut or alter structural members without approval of the Department of Energy Contracting Officers Representative (DOE/COR).
- I. After erection: prime welds, abrasions, and surfaces not shop primed.
- J. Installation of joists shall be in accordance with the standard specification under which the member was produced.
 - 1. Joists shall be handled in a manner to avoid damage.
 - 2. Damaged joists shall be removed from the site, except when field repair is approved by the DOE/COR and such repairs are satisfactorily made in accordance with the manufacturer's recommendations.
 - 3. Joists shall be accurately set, and end anchorage shall be in accordance with the standard specification under which the joists were produced.
 - 4. Loads shall not be applied to bridging.
 - 5. Abraded, corroded, and field-welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.
- K. Weld field connections in accordance with AWS D1.1.

END OF SECTION

DIVISION 5

METALS

SECTION: 05300

TITLE: STEEL ROOF AND FLOOR DECKING

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SECTION 05300

STEEL ROOF AND FLOOR DECKING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Steel roof deck
- B. Steel floor deck
- C. Steel deck and forms to contain wet concrete
- D. Framing for openings
- E. Bearing plates and angles

1.02 RELATED WORK

- A. Section 03001 - Plain and Reinforced Concrete
- B. Section 05120 - Structural Steel and Miscellaneous Metal
- C. Section 05210 - Steel Joists

1.03 REFERENCES

- A. American Iron and Steel Institute (AISI):
 - AISI SPEC Specifications for the Design of Cold-Framed Steel Structural Members
- B. American Society for Testing and Materials (ASTM):
 - ASTM A36 Structural Steel
 - ASTM A446 Steel Sheet, Zinc-Coated by the Hot-Dip Process, Structural Quality
 - ASTM A525 Steel Sheet, Zinc-Coated, Galvanized by the Hot-Dip Process
- C. American Welding Society (AWS):
 - AWS D1.1 Structural Welding Code
- D. Steel Deck Institute (SDI):
 - SDI MAN Design Manual for Composite Decks, Form Decks, Roof Decks

1.04 SUBMITTALS

- A. Submit shop drawings and product data. See Section 01300.
- B. Shop drawings:
 - 1. Fabrication shall not be started prior to approval of the shop drawings by the Department of Energy Contracting Officers Representative (DOE/COR).
 - 2. Indicate decking plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.
 - 3. Indicate temporary shoring of decking where required.
- C. Design computations for the structural properties of the deck units or SDI certification that the units are designed in accordance with the SDI SPEC shall be submitted with the shop drawings.
- D. Product data: provide deck profile characteristics and dimensions, structural properties, finishes, location, and sequence of welded and button punch connections.
- E. Manufacturer's installation instructions: indicate specific installation sequence and special instructions.

1.05 QUALITY ASSURANCE

- A. Section properties shall be determined in accordance with AISI SPEC.
 - 1. Whenever practicable, units shall span 2 or more spans.
 - 2. On spans under 10 feet, the deck units shall extend over 3 or more supports.
 - 3. The maximum allowable deflection of deck and maximum working stress shall conform to the SDI MAN.
 - 4. Deck with cross-sectional configuration differing from the units indicated may be used, provided that the properties of the proposed units are equal to or greater than the properties of the units indicated and that the material will fit the space provided without requiring revisions to adjacent materials or systems.
 - 5. There shall be no loads suspended from the deck.

- B. Prior to the installation of any steel decking units, the welders shall, under simulated field conditions, demonstrate satisfactory ability to weld the decking units to be used.
 - 1. In this demonstration, the materials, equipment, and procedures must also prove satisfactory before they are used in actual installation.
 - 2. After adjustment of the equipment by experimental welding, each welder shall make five test welds of each type to be used on the job.
 - 3. In order to qualify for work on the project, 1/2inch diameter test welds shall show minimum 3/8inch diameter buttons when sheared from supports. All test welds shall be free of cracks, craters, and other defects.
- C. Design deck layout, spans, fastening, and accessories under the direct supervision of a Licensed Professional Engineer experienced in design of this type of work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. See Section 01600.
- B. Store and protect products. See Section 01600.
- C. Cut plastic wrap to encourage ventilation.
- D. Store decking on dry wood sleepers; slope for positive drainage.
- E. Finish of deck shall be maintained at all times by using touch-up paint whenever necessary to prevent the formation of rust.

1.07 FIELD MEASUREMENTS

- A. Verify that measurements on site are as shown on the Drawings prior to shop fabrication.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sheet steel: ASTM A446 structural quality; with G90 Class A galvanized coating conforming to ASTM A525.
- B. Bearing plates and angles: ASTM A36 steel.
- C. Welding materials: AWS D1.1.

- D. Touch-up primer: zinc-chromate type with a high zinc-dust content.

2.02 ACCESSORIES

- A. The manufacturer's standard type accessories shall be furnished as necessary to complete the roof deck installation. Metal accessories shall be of the same material as the deck and have minimum gauge as follows: saddles, 18 gauge; welding washers, 10 gauge; cant strip, 22 gauge; other metal accessories, 20 gauge, unless otherwise indicated.

- B. Adjusting plates:

- 1. Adjusting plates or segments of deck units shall be provided in locations too narrow to accommodate full-size units.
- 2. As far as practical, the plates shall be the same gauge and configuration as the deck unit.

- C. Closure plates:

- 1. Voids above interior walls shall be closed with 22 gauge sheet metal where shown.
- 2. Open deck cells at parapets, end wall, eaves, and openings through roofs shall be closed with 22 gauge sheet metal.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect metal decking in accordance with manufacturer's instructions and the SDI MAN.
 - 1. Damaged deck and accessories and units with burned holes shall not be installed.
 - 2. The deck units shall be placed on secure supports, properly adjusted, and aligned at right angles to supports before being permanently secured in place.
- B. The deck shall not be used for storage or as a working platform until the units have been secured in position.
 - 1. Loads shall be distributed by appropriate means to prevent damage during construction and to the completed assembly.

2. The maximum uniform distributed storage load shall not exceed the design live load.
 3. Acoustical material, if specified, shall be neatly fitted into the rib voids.
- C. Bear decking on masonry and concrete surfaces with a 4 inch minimum bearing. Align and level.
- D. Bear decking on steel supports with a 3 inch minimum bearing. Align and level.
- E. Fasten deck to steel support members at ends and intermediate supports with fusion welds through weld washers at 12 inches centers maximum or as shown on the Drawings.
- F. Weld in accordance with AWS D1.1.
- G. Weld side laps as shown on the Drawings.
- H. Holes and openings indicated shall be drilled or cut, reinforced and framed as shown.
1. Other holes and openings required shall be drilled or cut, reinforced, and framed for rigidity and sufficient load-carrying capacity.
 2. Holes less than 6 inches across shall require no reinforcement.
 3. Openings 6 to 12 inches across shall be reinforced by 22 gauge steel sheet at least 12 inches wider and longer than the opening and be fastened to the steel deck a maximum of 12 inches on center.
 4. Openings larger than 12 inches shall be reinforced by steel angles on opposite sides of the opening and at right angles to the deck rib.
 5. Angles shall extend at least 2 ribs beyond each side of the opening.
- I. Level and align cellular deck intended for electrical raceways and mechanical piping within 1/8 inch horizontally and vertically.
1. Butt ends together, maximum allowable gap is 1/8 inch.

2. Install sheet steel covers over gaps wider than 1/8 inch.
 3. Tape-seal joints watertight.
-
- J. To contain wet concrete, install stops at roof edge upturned to top surface of slab. Provide stops of sufficient strength to remain stationary under wet concrete without distortion.
 - K. Install sheet-steel closures and angle flashings to close openings between deck and walls, columns, and openings.
 - L. Install foam flute closures above walls and partitions perpendicular to deck flutes.
 - M. Position roof pans with flange bearing on top surface of deck. Fusion weld as required.
 - N. Place metal cant strips in position and fasten as required.
 - O. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating with touch-up prime paint.

END OF SECTION

DIVISION 5

METALS

SECTION: 05400

TITLE: COLD FORMED METAL FRAMING

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SECTION 05400

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Exterior and interior wall framing
- B. Formed-steel joists and bridging

1.02 RELATED WORK

- A. Section 05120 - Structural Steel and Miscellaneous Metal
- B. Section 05210 - Steel Joist
- C. Section 05300 - Steel Roof and Floor Decking

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

- | | |
|-----------|--|
| ASTM A90 | Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles |
| ASTM A446 | Steel Sheet, Zinc-Coated by Hot Dip Process, Structural Quality |
| ASTM A525 | Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process |
| ASTM A570 | Hot-Rolled Carbon Steel Sheet and Strip Structural Quality |
| ASTM A611 | Steel, Cold-Rolled Sheet, Carbon, Structural |

B. Association of Wall and Ceiling Industries (AWCI):

- | | |
|-----------|---|
| AWCI SPEC | Specifications Guide for Cold Formed Steel Structural Members |
|-----------|---|

C. American Welding Society (AWS):

- | | |
|----------|-------------------------|
| AWS D1.1 | Structural Welding Code |
|----------|-------------------------|

D. Federal Specifications (FS):

FS TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type

1.04 SUBMITTALS

A. Submit shop drawings, product data, and manufacturer's installation instructions. See Section 01300.

B. Shop drawings:

1. Fabrication shall not be started prior to approval of the shop drawings by the Department of Energy Contracting Officers Representative (DOE/COR).
2. Indicate on shop drawings: component details, framed openings, bearings, anchorages, loadings, welds, types and locations of fasteners, and accessories or items required by other related work.
3. Provide stud, floor-joist, ceiling-joist, roof-joist, roof-rafter, roof-truss, and framing layouts.
4. Describe method for securing studs to tracks and for bolted or welded framing connections.
5. Provide calculations for load and stresses of specially fabricated, designed framing, and roof trusses sealed by a Licensed Professional Engineer experienced in design of work of this type.

C. Provide product data on standard framing members. Describe materials and finish, product criteria and limitations.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with the AWCI SPEC.

B. Size components to withstand design loads.

C. Assemble system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal or cyclic day/night temperature ranges.

D. Assemble system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.06 FIELD MEASUREMENTS

- A. Verify that measurements on site are as shown on the Drawings prior to starting shop fabrication.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

- A. All studs and accessories shall be of the type, size, gauge and spacing as shown on the Drawings and shall conform to ASTM A570 and A611.
- B. All painted studs, 16 gauge or heavier, shall be formed from sheet steel having a minimum yield of 50 ksi.
- C. All galvanized studs, 16 gauge or heavier, shall be formed from steel that conforms to the requirements of ASTM A446, with a minimum yield of 50 ksi.

2.02 ACCESSORIES

- A. Bracing, furring, bridging plates, gussets and clips shall be formed sheet steel using the manufacturer's standard shapes and with the same finish as framing members.

2.03 FASTENERS

- A. Self-drilling, self-tapping screws, bolts, nuts and washers shall be ASTM A90, hot-dip galvanized.
- B. Anchorage devices shall be power driven, powder-actuated or drilled expansion bolts, and screws with sleeves.
- C. Welding shall conform with AWS D1.1.

2.04 FABRICATION

- A. Framing components may be pre-assembled into panels prior to erecting. Prefabricated panels shall be square with components attached in a manner as to prevent racking.
- B. All framing components shall be cut squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.

2.05 FINISHES

- A. Galvanizing: ASTM A525, with class G90 coating.
- B. Primer: FS TT-P-645, touch-up for galvanized surfaces.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that substrate surfaces and building framing components are ready to receive work.
- B. Beginning of installation means acceptance of existing conditions and substrate.

3.02 ERECTION OF STUDDING

- A. Install components in accordance with manufacturer's instructions.
- B. Align floor and ceiling tracks located to wall partition layout.
 - 1. Secure in place with fasteners or welding at maximum 24 inches centers.
 - 2. Coordinate installation of sealant with floor and ceiling tracks.
- C. Place studs as required, not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using crimping, clip and tie, fastener or welding method in accordance with manufacturer's recommendations.
- D. Construct corners using a minimum of 3 studs.
 - 1. Double stud at wall opening, door, and window jambs.
 - 2. Install intermediate studs above and below openings to match the wall studs spacing.
- E. Provide deflection allowance below supported horizontal building framing in ceiling or head track for non-loadbearing framing.
- F. Attach cross studs or furring channels to studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, grab bars, and other items anchored to partitions or walls.

- G. Install framing between studs for attachment of electrical and mechanical items.
- H. Erect loadbearing studs in one piece for the full length.
 - 1. Splicing and wire tying of framing components is not permitted.
 - 2. Join members forming trusses by welding.
- I. Extend stud framing through ceilings to underside of floor or roof structure above, except at partitions.
- J. Make provision for erection stresses.
 - 1. Provide temporary alignment and bracing.
 - 2. Touch-up field welds and scratched or damaged primer.
- K. Ensure framing provides true and flat surfaces ready to receive gypsum board finish.

3.03 ERECTION OF JOISTS

- A. Install framing components in accordance with manufacturer's instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.
- C. Place joists as required not more than 2 inches from abutting walls. Connect joists to supports using fastener or welding method as required.
- D. Set floor or ceiling joists parallel and level with lateral bracing and bridging.
- E. Locate joist end bearing directly over loadbearing studs or provide load distributing member to top of stud track.
- F. Provide joist web stiffeners at reaction points.
- G. Touch-up field welds and damaged galvanized surfaces with primer.

END OF SECTION

DIVISION 6
WOOD AND PLASTIC

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T H I S S E C T I O N R E S E R V E D

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DIVISION 7
THERMAL AND MOISTURE CONTROL
SECTION: 07175
TITLE: WATER REPELLENT COATING

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SECTION 07175

WATER REPELLENT COATING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Water repellent coatings

1.02 RELATED WORK

- A. Section 07900 - Caulking and Joint Sealants

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM E514 Standard Test Method for Water Penetration and Leakage Through Masonry

ASTM G53 Practice for Operating Light- and Water-exposure Apparatus for Exposure of Nonmetallic Materials

1.04 SUBMITTALS

- A. Submit product data and manufacturer's installation instructions. See Section 01300.
- B. Include details of product description, tests performed, limitations to coating, cautionary procedures required during application, and chemical properties including percentage of solids.
- C. Submit manufacturer's certification that installed materials meet the requirements of this Specification. See Section 01400.

1.05 QUALITY ASSURANCE

- A. Manufacturer: company specializing in manufacture of water-repellent coatings with a minimum of three years experience in work of this type.
- B. Applicator: acceptable to manufacturer.
- C. All materials shall be as specified in brand and quality or approved equal and tested according to the provisions of ASTM E514, Class E, after application.

1.06 FIELD SAMPLE

- A. Apply coating to a field mockup of respective surfaces. See Section 01400.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply coating when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

1.08 WARRANTY

- A. Provide a five-year warranty, jointly with the masonry subcontractor and the waterproofing materials manufacturer, against water penetration due to defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MATERIALS

- A. The waterproofing material shall be "Weather Seal Siloxane" or "Weather Seal H140" by Prosoco, Inc., or approved equal. A clear penetrating type containing no silicone oils or paraffin waxes and with the following chemical and performance standards:

1. Chemical solids by weight: 6.7%.
2. Minimum viscosity: 0.9 centipoise maximum (75 degrees F).
3. Accelerated weathering (ASTM G53): 1000 hours.
4. Still water resistant.

- B. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 EQUIPMENT

- A. Clear waterproofing materials shall be applied using a low-pressure material pump.
 1. Fluid pressure is not to exceed 20 psi at any time.
 2. Pump shall not atomize, but shall flow the material on the wall.

PART 3 EXECUTION

3.01 GENERAL

- A. Preparation and application shall be inspected by the manufacturer's certified representative.

3.02 PREPARATION OF SURFACE

- A. Surface cleanliness is critical to the proper application and the ultimate appearance of the masonry surfaces. All surfaces shall be:
 - 1. Cured for a minimum of 21 days in dry weather conditions.
 - 2. Sound, dry, and free of dirt, dust, oil, grease, asphalt, and form-release agents.
 - 3. Cleaned of weeped excess mortar, stains, mildew, paint, efflorescence, and other contamination, which would adversely affect the appearance or performance of the product.
- B. Hardened grout and mortar smears shall be removed by sandblasting. Etch glossy, glazed, or dense surfaces by lightly sandblasting to a uniform surface profile.
- C. Defective mortar joints shall be routed out, pointed with mortar, and tooled.
 - 1. All other cracks and voids shall be filled with a suitably colored mortar-patching mixture to match the surface.
 - 2. Particular attention should be given to this step of the application.

3.03 INSPECTION AND TESTING

- A. The surface shall be inspected jointly by the masonry subcontractor and the waterproofing manufacturer. Both parties must submit written approval of the surface prior to the application of any waterproofing materials.
- B. The masonry surfaces shall be tested for moisture content. A minimum of one reading shall be taken for each 200 square feet of wall and the results tabulated.
- C. The moisture content shall not exceed 15% on any surface prior to waterproofing application.

3.04 APPLICATION

- A. Manufacturer's recommended application consists of a light mist coat to break surface tension followed by a flood coat.
1. Make one flood-coat pass each way over the top section of the wall followed by overlapping passes down the wall.
 2. Hold the spray head 8 to 10 inches from the surface so that the flood coat runs freely down the surface 6 to 8 inches below the point of application.
 3. Spray by traveling horizontally to ensure uniform coverage.
 4. Overlap each following pass by approximately 50%.
 5. Start each new section by holding the spray head centered on the bottom line of the previous pass.
 6. Repeat the procedure on spots which absorb too quickly.
 7. Apply a second coat where required, after all areas have been allowed to dry a minimum of 24 hours; apply the second coat using the procedure described for the first coat.

3.05 PROTECTION AND CLEANUP

- A. During application, protect all adjacent surfaces including walks and driveways.
- B. Remove any waterproofing residue from adjacent work as soon as possible and before curing begins. Remove daily all excess materials, equipment, and debris incidental to this work.

END OF SECTION

DIVISION 7
THERMAL AND MOISTURE CONTROL

SECTION: 07200

TITLE: INSULATION

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SECTION 07200

INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Sound attenuation batts
- B. Insulation at interior concrete faces
- C. Batt and blanket insulation

1.02 RELATED WORK

- A. Section 02223 - Backfilling
- B. Section 07465 - Preformed Metal Siding
- C. Section 07620 - Sheet Metal Flashing and Trim
- D. Section 07900 - Caulking and Joint Sealants
- E. Section 09111 - Metal Stud Framing, Furring, and Lathing Systems
- F. Section 09260 - Gypsum Board Systems
- G. Section 09511 - Suspended Ceiling Systems
- H. Section 15410 - Plumbing Piping
- I. Section 16010 - Basic Electrical Requirements

1.03 REFERENCES

- A. Federal Specifications (FS):
 - FS HH-I-521 Mineral Fiber Blanket/Batt Insulation
 - FS HH-I-526 Insulation Board, Thermal (Mineral Aggregate)
 - FS HH-I-530 Insulation Board, Thermal (Mineral Aggregate)
 - FS HH-I-1972/1 Urethane Isocyanurate Board Insulation
 - FS SS-C-153 Cement, Bituminous, Plastic

- B. Underwriters Laboratories Inc. (UL).

1.04 SUBMITTALS

- A. The Contractor shall submit proof that fastening for application of under-roof and board insulation for use as perimeter insulation meets the requirements of UL or FM for Class I materials.
- B. Four samples of each bitumen used on the Project shall be furnished for approval.

1.05 QUALITY ASSURANCE

- A. Craftsmen and mechanics shall have prior experience in installing the insulation systems approved for use.
- B. Insulation shall not be exposed to moisture in any form before, during, or after delivery to site. Wet materials shall not be used and shall be removed from the worksite.
- C. For 24 hours immediately before laying, materials shall be maintained at a temperature above 50 degrees F.
- D. Do not deliver plastic insulation to project site prior to time of installation.
- E. Protect plastic insulation against ignition at all times.
- F. Do not allow plastic insulation to remain exposed; protect with other work as indicated immediately upon installation.

PART 2 PRODUCTS

2.01 ADHESIVE SEALER

- A. Bituminous cement: FS SS-C-153, Type I (Burke Emulsion).
- B. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

- A. Mineral fiber insulation board: FS HH-I-526.
- B. Composite board faces: one course of 1/2 inch minimum thickness bonded perlite, glass fiber, or fiberboard insulation; top face of bituminous felt/fiber mat for below grade application.

- C. Rigid urethane isocyanurate: FS HH-I-530; 2.5 pound density; Type I, Grade 2 (aged k = 0.12 maximum at 50% relative humidity and 73 degrees F for 180 days). Board face for underground use shall be asphalt-saturated asbestos.
- D. Mineral fiber blanket/batt insulation: inorganic non-asbestos fiber formed with binders into resilient blankets or batts complying with FS HH-I-521, "k" value of 0.27, semi-rigid type where required for self support as shown on approved system.
 - 1. Paper-faced units: provide one face including integral nailing flanges with 0.5 perm-rated paper facing; other face, if required, minimum 5.0 perm rated.
 - 2. Foil-faced units: provide one face including integral nailing flanges with 0.5 perm-rated reflective aluminum foil facing; other face, if required, minimum 5.0 perm rated.
 - 3. Fire-resistant units: where indicated with a rating or used in a rated assembly for fire endurance, provide noncombustible mineral-wool units (not glass fiber).
- H. Protection board for foundation perimeter insulation: premolded, semi-rigid, asphalt and fiber composition board; 1/8 inch thick over rigid fiberglass.
- I. Polyisocyanurate board insulation: complying with FS HH-I-1972/1; 20 psi, R value of 8.33 per inch, installed with foil faced to room interior.

PART 3 EXECUTION

3.01 APPLICATION REQUIREMENTS

- A. Surfaces shall be inspected and approved prior to application of insulation. The surfaces shall be smooth; firm; and free from ice, frost, surface moisture, dirt, projections, and foreign materials.
- B. Application of materials shall not be performed during damp, wet, or excessively windy conditions or when the ambient temperature is less than 40 degrees F, except when used as part of composite board insulation.

3.02 ASPHALT SEALANT

- A. Asphalt shall be used with asphalt-saturated felts.
- B. Asphalt shall not be heated above 475 degrees F.

- C. Heating kettles shall be provided with a thermometer. Kettlemen shall be in attendance at all times during heating to insure that the maximum temperature specified is not exceeded.
- D. The Equiviscous Temperature (EVT) shall be printed on the labels or bills of lading of asphalt. The temperature of asphalt at the point of application shall be within 25 degrees of the EVT.

3.03 PROTECTION BOARD

- A. Install protection board before backfilling or placing structural concrete against insulation.
- B. Place backfill using selected material and appropriate methods to avoid mechanical damage to the protection boards. See Section 02223.

3.04 INSULATION PLACEMENT

- A. Support building insulation units by means of adhesive anchorage or mechanical fasteners to ensure permanent placement tight to joints without sag or displacement.

3.05 TAPED JOINTS

- A. Seal joints on inside face of insulating units with vapor-barrier facing using self-adhesive vapor-barrier tape. Tape over and seal at edges of coverage and at penetrating elements to form a complete vapor barrier in each area.

3.06 INSULATION CLOSURE REQUIREMENTS

- A. Batt and blanket insulation shall be installed in all spaces between girts and studs and in all closure areas to maintain the effective "R" values. Barrier tape shall cover girts and purlins as required.

3.07 SOUND BATTING

- A. Sound insulation batts of glass-fiber material 3 inches thick shall be installed within the interior walls from floor to 12 inches above ceiling.
- B. Sound insulation batts 24 inches wide x 12 inches thick shall be installed over entire ceiling.
- C. Insulation shall be bridged over heat-generating units as required by the applicable codes and the standards of the insulation manufacturer.

3.08 DAMAGED MATERIALS

- A. Any materials found marred, torn, punctured, or crushed so as to be less effective than required shall be removed and replaced.

END OF SECTION

DIVISION 7
THERMAL AND MOISTURE CONTROL
SECTION: 07465
TITLE: PREFORMED METAL SIDING

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SECTION 07465

PREFORMED METAL SIDING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Preformed metal siding system
- B. Base track
- C. Base flashing
- D. Accessories, sealants and gaskets

1.02 RELATED WORK

- A. Section 01300 - Submittals
- B. Section 05120 - Structural Steel and Miscellaneous Metal
- C. Section 07200 - Insulation
- D. Section 07620 - Sheet Metal Flashing and Trim
- E. Section 07900 - Caulking and Joint Sealants
- F. Section 08111 - Standard Steel Doors and Frames
- G. Section 09111 - Metal Stud Framing, Furring, and Lathing System
- H. Section 09900 - Painting

1.03 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - AISC SPEC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
- B. American Society for Testing and Materials (ASTM):
 - ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - ASTM A446 Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality

ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

C. International Conference of Building Officials (ICBO):

UBC Uniform Building Code

D. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

A. Submit shop drawings, product data, and manufacturer's installation instructions. See Section 01300.

B. Indicate dimensions, panel layouts, construction details, methods of anchorage, and method and sequence of installation.

C. Submit manufacturer's standard color samples for selection. See Section 01300.

D. Submit one 9 inch high, full-width panel sample.

1.05 QUALITY ASSURANCE

A. Installer: company specializing in the erection of preformed metal siding with a minimum of two years' experience in work of this type.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Butler Manufacturing Company.

B. Bellen Manufacturing.

C. Metallic-Braden Building Systems.

D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

A. Sheet stock: ASTM A446, Grade A steel; galvanized minimum 1.25 ounces per square foot.

- B. Insulation: See Section 07200.
- C. Sealants and gaskets: See Section 07900.
- D. Contact cement: waterproof, all-weather type, cured resilient without final set.
- E. Fasteners:
 - 1. Manufacturer's standard type to suit application.
 - 2. With soft neoprene washers.
 - 3. Galvanized to ASTM A153, 2.0 ounces per square foot coating.
 - 4. Finish to match metal siding when exposed.
- F. Panels shall be 36 inches wide and formed without horizontal joints for the full height of the exterior walls.
- G. Panels shall be formed with 24 gauge material.
- H. Surfaces shall be prefinished at the factory with Kynar 500 fluorocarbon of 1 mil minimum thickness of the specified special color on the exterior side.
- I. Panels shall be water tested according to ASTM E331 for 0 perms at 20 miles per hour wind load. Submit test and/or supporting data. See Section 01300.
- J. Panels shall be tested according to ASTM E84 and the UL Guide Specification Test NYVQ for a flame-spread rating not greater than 25 and fuel-contributed and smoke-developed ratings not greater than 50.
- K. Touch-up paint: See Section 09900.

2.03 FABRICATION

- A. Siding panels: lapped siding fitted with continuous gaskets where overlapping occurs.
- B. Soffit panels: minimum 24 gauge sheet stock of same material and finish as siding or as indicated. Lapped edges fitted with continuous gaskets.
- C. Internal and external corners: same material, thickness, and finish as siding.
- D. Expansion joints: same material and, where exposed, finish as panels; 24 gauge, manufacturer's standard, brake-formed.

- E. Trim, closure pieces, caps, fascias, and infills: same material, thickness and, where exposed, finish as sheet stock; brake-formed to required profiles.
- F. Fabrication of component profiles on site not permitted.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation shall commence from the windward side of the building frame to alleviate racking and overstressing the building panel. Each joint shall be gasketed and sealed for a weathertight installation.
- B. Install metal siding, soffits, and related components in accordance with manufacturer's instructions.
- C. Use bituminous paint to protect siding surfaces in contact with cementitious materials and dissimilar metals. Allow to dry prior to installation.
- D. Remove site cuttings from finish surfaces.
- E. Permanently fasten siding system to structure; align, level, and plumb within specified tolerances.
- F. Provide expansion control joints where indicated.
- G. Place and seal gaskets to prevent weather penetration. Maintain neat appearance.

3.02 TOLERANCES

- A. Maximum offset from true alignment of adjacent members butting or in line: 1/16 inch
- B. Maximum variation from plane or location indicated on drawings: 1/8 inch

3.03 ALIGNMENT OF FRAMES

- A. Examine the alignment of the structural steel before installation of the metal panels. Do not proceed if the structural steel is not aligned within the tolerances given in the AISC SPEC.

3.04 DAMAGE

- A. Protect panels from denting and marring.
- B. Replace damaged panels rejected by the DOE/COR.

END OF SECTION

DIVISION 7
THERMAL AND MOISTURE CONTROL
SECTION: 07620
TITLE: SHEET METAL FLASHING AND TRIM

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SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Flashings
- B. Fascias and scuppers
- C. Counterflashings

1.02 RELATED WORK

- A. Section 07514 - Built-up Bituminous Roofing
- B. Section 07631 - Gutters and Downspouts
- C. Section 07900 - Caulking and Joint Sealants
- D. Section 09900 - Painting

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM A525 Steel Sheet, Zinc Coated, (Galvanized)
by the Hot-Dip Process
- B. Federal Specifications (FS):
 - FS O-F-506 Flux, Soldering, Paste and Liquid
 - FS QQ-S-571 Solder, Tin Alloy
 - FS SS-C-153 Cement, Bituminous, Plastic
- C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - SMACNA MAN Architectural Sheet Metal Manual

1.04 SUBMITTALS

- A. Submit shop drawings, product data, and manufacturer's installation instructions. See Section 01300.

- B. Describe material profile, jointing pattern, jointing details, fastening methods, and installation details.

1.05 QUALITY ASSURANCE

- A. Applicator: company specializing in sheet-metal flashing work with a minimum of three years' experience in work of this type.

1.06 SYSTEM DESCRIPTION

- A. Work of this Section is to physically protect membrane roofing and base flashings from damage that would permit water leakage to building interior.

1.07 STORAGE AND HANDLING

- A. Store products. See Section 01600.
- B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion and to provide ventilation.
- C. Prevent contact during storage with materials which may cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Galvanized steel: ASTM A525, 26 gauge core steel.

2.02 ACCESSORIES

- A. Fasteners: galvanized steel with soft neoprene washers at exposed fasteners.
 - 1. Finish exposed fasteners same as flashing metal.
- B. Protective backing paint: zinc-chromate alkyd.
- C. Slip sheet: rosin-sized building paper.
- D. Plastic cement: FS SS-C-153, Type I, asphaltic-base cement.
- E. Solder: FS QQ-S-571; 50/50 type.
- F. Flux: FS O-F-506.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats and starter strips of same material as sheet, minimum four inches wide, interlockable with sheet.
- C. Form pieces in longest practical lengths.
- D. Hem exposed edges on underside 1/2 inch. Miter and seam corners.
- E. Form material with flat lock seam.
- F. Solder and seal metal joints.
 - 1. After soldering, remove flux.
 - 2. Wipe and wash solder joints clean.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- H. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.
- I. Form sheet-metal pans 6 inches square (nominal size) with 3 inch upstands and 4 inch flanges. Fill pans watertight with plastic cement.

2.04 FINISH

- A. Shop-prepare and prime exposed ferrous metal surfaces.
- B. Backpaint concealed metal surfaces with protective backing paint to a minimum dry-film thickness of 15 mils.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set; cant strips and reglets are in place; and nailing strips are located.
- B. Verify that membrane terminations and base flashings are in place, sealed, and secure.

- C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Field-measure site conditions prior to fabricating work.
- B. Install starter and edge strips and cleats before starting installation.
- C. Install surface-mounted reglets true to lines and levels. Seal tops of reglets with sealant.
- D. Insert flashings into reglets to form tight fit.
 - 1. Secure in place with lead wedges at 12 inches maximum on centers.
 - 2. Seal flashings into reglets with sealant.
- E. Secure flashings in place using concealed fasteners.
- F. Lock and seal all joints.
- G. Apply plastic-cement compound between metal flashings and felt flashings.
- H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- I. Seal metal joints watertight.

3.03 INSTALLATION

- A. Conform to drawing details included in SMACNA MAN.

END OF SECTION

DIVISION 7
THERMAL AND MOISTURE CONTROL
SECTION: 07631
TITLE: GUTTERS AND DOWNSPOUTS

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SECTION 07631

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Gutters and downspouts
- B. Precast-concrete splash blocks

1.02 RELATED WORK

- A. Section 07620 - Sheet Metal Flashing and Trim
- B. Section 09900 - Painting

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM A525 General Requirements for Steel Sheet,
Zinc-Coated (Galvanized) by the Hot-Dip
Process

ASTM B209 Aluminum and Aluminum Alloy Sheet and
Plate

- B. Federal Specifications (FS):

FS O-F-506 Flux, Soldering, Paste and Liquid

FS QQ-S-571 Solder, Tin Alloy, Tin-Lead Alloy, and
Lead Alloy

- C. Sheet Metal and Air Conditioning Contractors National
Association (SMACNA):

SMACNA MAN Architectural Sheet Metal Manual

1.04 SUBMITTALS

- A. Submit shop drawings and product data. See Section
01300.
- B. Indicate on shop drawings general construction,
configurations, jointing methods and locations,
fastening methods, locations, and installation details.

C. Provide product data on prefabricated components.

1.05 QUALITY ASSURANCE

A. Conform to the Drawings for nominal sizing of components.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site. See Section 01600.

B. Store and protect products. See Section 01600.

C. Stack preformed and prefinished material to prevent twisting, bending, or abrasion and to aid ventilation. Slope to drain.

D. Prevent contact during storage with materials which may cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized steel: ASTM A525; 26 gauge steel core.

B. PVC: virgin vinyl, high-impact type, color-fast; color as selected by the COR.

C. Aluminum sheet: ASTM B209 as specified on the Drawings.

2.02 COMPONENTS

A. Gutters: rectangular, square, or semi-circular SMACNA profile.

B. Downspouts: rectangular, square, or round profile.

C. Splash blocks: precast-concrete of size and profiles indicated; 3,000 pounds per square inch (psi) minimum at 28 days; with 5% minimum air entrainment.

2.03 ACCESSORIES

A. Anchorage devices: SMACNA MAN requirements.

B. Gutter supports.

C. Downspout supports.

D. Protective backing paint: zinc-chromate alkyd.

E. Solder: FS QQ-S-571; 50/50 type.

F. Flux: FS O-F-506.

2.04 FABRICATION

- A. Field-measure site conditions prior to fabricating work.
- B. Form gutters and downspouts to profiles and sizes indicated.
- C. Fabricate with required connection pieces.
- D. Form sections square, true, and accurate in size; in maximum possible lengths; and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- E. Hem exposed edges of metal.
- F. Solder metal joints.
 - 1. After soldering, remove flux.
 - 2. Wipe and wash solder joints clean.
- G. Fabricate gutter and downspout accessories; solder watertight.

2.05 SHOP FINISHING

- A. Shop prepare and prime exposed ferrous metal surfaces.
- B. Backpaint concealed metal surfaces with protective backing paint.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that surfaces are ready to receive work and conditions are as indicated on the Drawings.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Join lengths with seams sealed watertight. Flash and seal gutters to downspouts and accessories.

- C. Apply backing paint to metal back surfaces.
- D. Apply bituminous protective backing on surfaces in contact with dissimilar materials.
- E. Slope gutters 1/8 inch per foot minimum.
- F. Solder metal joints watertight for full metal surface contact. After soldering, wash metal clean with neutralizer solution and rinse with water.
- G. Set splash blocks under downspouts.

END OF SECTION

DIVISION 7
THERMAL AND MOISTURE CONTROL
SECTION: 07710
TITLE: PREFABRICATED ROOF SPECIALTIES

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PART 1 GENERAL

1.01 Work Included

1.02 Related Work

1.03 References

1.04 Submittals

1.05 Quality Assurance

PART 2 PRODUCTS

2.01 Components

PART 3 EXECUTION

3.01 Inspection

3.02 Installation

DIVISION 7
THERMAL AND MOISTURE CONTROL
SECTION: 07900
TITLE: CAULKING AND JOINT SEALANTS

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SECTION 07900

CAULKING AND JOINT SEALANTS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Preparation of substrate surfaces
- B. Sealant and backing

1.02 RELATED WORK

- A. Section 04000 - Reinforced Concrete Unit Masonry
- B. Section 07160 - Bituminous Dampproofing
- C. Section 07620 - Sheet Metal Flashing and Trim
- D. Section 08111 - Standard Steel Doors and Frames
- E. Section 08700 - Builder's Hardware
- F. Section 08800 - Glass and Glazing
- G. Section 09511 - Suspended Ceiling Systems

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

- ASTM C790 Use of Latex Sealing Compounds
- ASTM C804 Use of Solvent-Release Type Sealants
- ASTM C834 Latex Sealing Compounds

B. Federal Specifications (FS):

- FS TT-C-00598 Caulking Compound, Oil and Resin Base Type
- FS TT-S-01657 Sealing Compound, Single Component, Butyl Rubber Based, solvent Release Type
- FS TT-S-00227 Sealing Compound: Elastomeric Type, Multi-Component

FS TT-S-00230 Sealing Compound: Elastomeric Type,
Single Component

FS TT-S-01543 Sealing Compound, Silicone Rubber Base

C. Sealing and Waterproofers Institute (SWI):

SWI SPEC Sealant and Caulking Guide Specification

1.04 SUBMITTALS

- A. Submit product data, samples, and manufacturer's installation instructions. See Section 01300.
- B. Submit product data indicating chemical characteristics, performance criteria, limitations, color availability, shelf life, curing time, and mixing instructions and copies of certificates of compliance.
- C. Submit one cartridge or equivalent representative sample of each caulking and sealant. The sample containers shall include the same information on the label as specified herein for containers delivered to the Project.

1.05 QUALITY ASSURANCE

- A. Manufacturer: company specializing in manufacturing the products specified in this section with a minimum of three years' experience in work of this type.
- B. Applicator: company specializing in applying the work of this Section with a minimum of three years' experience.
- C. Conform to SWI SPEC requirements for materials and installation.
- D. Each caulk and sealant container shall be marked with the number of the applicable FS.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install solvent-curing sealants in enclosed building spaces.
- B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 SEQUENCING AND SCHEDULING

- A. Coordinate work. See Section 01005.

1.08 . WARRANTY

- A. Provide a three-year warranty. See Section 01700.
- B. Include coverage of installed sealants and accessories which fail to achieve airtight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 SEALANTS

- A. Materials shall conform to the applicable requirements.
 - 1. Each container delivered to the project site shall be marked for the intended use.
 - 2. The selected color shall be one of the manufacturer's standard colors.
- B. Oil based: FS TT-C-00598, Type I, single component; color as selected. The listing below indicates the types of applications appropriate for use with oil-base and resin-base caulking:
 - 1. Openings 1/4 inch and less between walls and partitions, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, etc.
 - 2. Seats of metal thresholds for interior doors.
 - 3. Joints between metal edge members for acoustical tile and adjoining vertical surfaces.
 - 4. Other interior locations where small voids between materials require filling.
- C. Acrylic emulsion latex: ASTM C834, single component; color as selected by the Department of Energy Contracting Officers Representative (DOE/COR).
- D. Acrylic sealant: FS TT-S-00230, Type II, Class A; one component, elastomeric compound; color as selected by the DOE/COR.
- E. Butyl sealant: FS TT-S-001657, Type I.
- F. Polysulphide sealant: FS TT-S-00227, Type I, self-leveling, Class A, two-component elastomeric compound, color as selected by the DOE/COR.
 - 1. The compound shall be supplied in premeasured-kit form for on-the-job mixing.

2. The following applications are appropriate:
 - a. Construction joints in concrete floors.
 - b. Control joints.
 - c. Openings where items pass through exterior walls.
 - d. Bottoms of exterior doorway frames and thresholds.
 - e. Walkways.
 - f. Stud plates and floor angles of exterior construction or sound rated partitions.
- G. Polyurethane sealant: FS TT-S-00230, Type II, non-sag, Class A; one-component elastomeric compound; color as selected by the DOE/COR.
- H. Silicone sealant: FS TT-S-001543, Class A, low modulus; one-component non-sag; color as selected by the DOE/COR.
- I. Fire stop sealant: one part silicone elastomer or silicone RTV foam by Dow Corning or approved equal, primed and applied according to manufacturer's specifications for all fire-resistive penetrations.

2.02 ACCESSORIES

- A. Primer: nonstaining, recommended by sealant manufacturer to suit application. Primer shall have been tested for durability with the sealant to be used and on samples of the surfaces to be sealed.
- B. Joint cleaner: noncorrosive and nonstaining, recommended by sealant manufacturer for compatibility with joint-forming materials.
- C. Joint backing material: resilient urethane or polyvinyl chloride foam, closed-cell polyethylene foam, closed-cell vinyl or rubber sponge, polychloroprene tubes or beads, polyisobutylene extrusions, or oil-less dry jute or rope yarn.
 1. Backstop material shall be nonabsorbent, nonstaining, and compatible with the sealant used.
 2. Tube or rod stock shall be rolled into the joint cavity.
 3. Preformed support strips for ceramic tile control-joint work shall be polyisobutylene or polychloroprene rubber.

- D. Bond breaker: pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on the Drawings and recommended by the manufacturer.
- B. Beginning of installation means installer accepts existing substrate.

3.02 PREPARATION

- A. Clean and prime joints in accordance with manufacturer's instructions.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.
- D. Perform preparation in accordance with ASTM C804 (for solvent release) and ASTM C790 (for latex base) sealants.
- E. Protect elements surrounding the work of this section from damage or disfiguration.

3.03 INSTALLATION

- A. Install sealant in accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve width-to-depth ratios required.
- C. Install joint backing to achieve a neck dimension no greater than $1/3$ the joint width.
- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

- G. Tool joints as detailed.
- H. Acoustical sealant shall be applied only to concealed surfaces.
 - 1. A full bead shall be gunned into joints or openings.
 - 2. Piping and backs of electrical boxes shall be covered with a sealant and perimeters sealed.

3.04 CLEANING AND REPAIRING

- A. Clean work. See Sections 01700 and 01710.
- B. Clean adjacent soiled surfaces.
- C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished installation. See Section 01500.
- B. Protect sealants until cured.

END OF SECTION

DIVISION 8
DOORS AND WINDOWS

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DIVISION 8
DOORS AND WINDOWS
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TITLE: METAL DOORS AND FRAMES

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SECTION 08100

METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Steel doors and panels
- B. Access doors and frames
- C. Interior light frames
- D. Louvers

1.02 RELATED WORK

- A. Section 08700 - Builder's Hardware
- B. Section 08800 - Glass and Glazing
- C. Section 09900 - Painting

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM E283 Test for Rate of Air Leakage Through Exterior, Curtain Walls and Doors
- B. Door Hardware Institute (DHI):
 - DHI GUIDE The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware
- C. National Fire Protection Association (NFPA):
 - NFPA 80 Fire Doors and Windows
 - NFPA 80A Protection of Buildings from Exterior Fire Exposure
- D. Steel Door Institute (SDI):
 - SDI 100 Standard Steel Doors and Frames
 - SDI 105 Recommended Erection Instructions for Steel Frames

E. Underwriters Laboratories Inc. (UL):

10A Tin-Clad Fire Doors

10B Fire Tests of Door Assemblies

1.04 SUBMITTALS

- A. Submit shop drawings, product data, and manufacturer's installation instructions. See Section 01300.
- B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
- C. Indicate door elevations, internal reinforcement, closure method, and cut outs for glazing or louvers.
- D. Include sizes, types, finishes, scheduled locations, and details of adjoining work.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of SDI 100.
- B. Fire-rated door assemblies shall bear identifying labels.
 - 1. Underwriters Laboratories Inc.
 - 2. Warnock Hersey International, Inc.
 - 3. Nationally recognized testing agency qualified to perform certificate programs indicating that units conform to or exceed the requirements of the Underwriters Laboratories.
 - 4. Doors exceeding the sizes for which label service is offered shall be inspected in accordance with NFPA 80 and NFPA 80A.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire-rated frames and doors.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Protect products. See Section 01600.
- B. Protect doors and frames with resilient packaging sealed with heat-shrunk plastic.
- C. Break seal on-site to permit ventilation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Metal doors and frames:

1. Ceco Door Division
2. Steelcraft
3. Bilt-Rite Steel Door Corp

B. Access doors:

1. Milcor
2. Bilco
3. J. L. Industries

C. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 DOORS AND FRAMES

A. Metal doors and frames:

1. Exterior doors: SDI 100, Grade II, Model 2.
2. Interior doors: SDI 100, Grade, 1 Model 1.
3. Exterior frames: 16 gauge thick material, core thickness to suit grade and model of door.
4. Interior frames: 16 gauge thick material, core thickness to suit grade and model of door.

B. Access doors: Fabricate frames and flanges of 16 gauge steel and door panels of 20 gauge steel; pan insulated with noncombustible filler.

2.03 DOOR CORES

A. Cores: vertical steel stiffeners and polyurethane insulation.

B. Insulated doors: insulation value of R 11.

2.04 ACCESSORIES

- A. Louvers: roll-formed steel material, prepainted finish to color selected; 1/2 inch blade, sightproof; fire-rated with fusible link, '2' design; 43% free area; tamperproof fasteners; manufactured by door manufacturer.
- B. Rubber silencers resilient rubber.
- C. Glazing stops: rolled-steel channel shape, mitered corners; prepared for countersink tamperproof screws.
- D. Access-door hardware: 175 degree steel hinges with pin, cylinder lock with latch, and two keys for each unit.

2.05 PROTECTIVE COATINGS

- A. Bituminous coating: fibered asphalt emulsion.
- B. Primer: rust-inhibiting primer, oven-dried. Finish shall be tested in accordance with ANSI A224.1.

2.06 FABRICATION

- A. Fabricate frames as welded units or knocked down field assembly types.
- B. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- C. Reinforce frames wider than 48 inches with roll-formed steel channels fitted tightly into frame head and flush with top.
- D. Prepare frames for silencers. Provide three, single, rubber silencers for single doors and mullions of double doors on strike side and two single silencers on frame head at double doors without mullions.
- E. Attach fire-rated label to each frame and door unit.
- F. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.
- G. Weatherstripping for head and jamb protection. See Section 08700.
 - 1. Doors and frames shall be tapped to receive the weatherstripping as specified and in accordance with the manufacturer's instructions.
 - 2. Weatherstripping for bottoms of doors shall be of the mounted sweep type and/or drop bottom type.

3. For the jambs the seal shall be either closed-cell neoprene sponge as a sound seal system or a closed-cell neoprene sponge system as air/fume seal meeting the requirements of ASTM E283.

2.07 FINISHES

- A. Interior units: 0.60 ounces per square foot galvanized.
- B. Exterior units: 1.25 ounces per square foot galvanized.
- C. Primer: baked on.
- D. Finish: pre-finished baked enamel or painted as specified in the Finish Schedule.
- E. Coat inside of frame profile with bituminous coating to a thickness of 1/16 inch. Coating may be shop or field applied.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify rough openings for doors and frames are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install frames in accordance with SDI 105.
- B. Install doors in accordance with DHI GUIDE.
- C. Coordinate with gypsum-wallboard wall construction for anchor placement.
- D. Coordinate installation of glass and glazing.
- E. Install door louvers.
- F. Install roll-formed steel-reinforcement channels between two abutting frames. Anchor to structure and floor.

3.03 ADJUSTING AND CLEANING

- A. Adjust hardware for smooth, balanced door movement.

END OF SECTION

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SECTION: 08330
TITLE: OVERHEAD DOORS

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SECTION 08330

OVERHEAD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Overhead coiling doors
- B. Operating hardware and supports

1.02 RELATED WORK

- A. Section 05120 - Structural Steel and Miscellaneous Metal
- B. Section 05400 - Cold Formed Metal Framing
- C. Section 06001 - Carpentry
- D. Section 07465 - Preformed Metal Framing
- E. Section 07900 - Caulking and Joint Sealants
- F. Section 08700 - Builder's Hardware
- G. Section 09900 - Painting
- H. Section 16010 - Basic Electrical Requirements

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - ANSI A216.1 Sectional Overhead Type Doors
- B. American Society for Testing and Materials (ASTM):
 - ASTM A446 Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality
 - ASTM A525 General Requirements for Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process.
 - ASTM A526 Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Commercial Quality

1.04 SUBMITTALS

- A. Submit shop drawings, product data, and manufacturers' installation instructions. See Section 01300.
- B. Indicate opening dimensions and tolerances, component construction, connections and details, anchorage methods and spacing, hardware and locations, and installation details.
- C. Submit operation and maintenance data. See Section 01700.
 - 1. See Section 01700.
 - 2. Include data for motor and transmission, shaft and gearing, lubrication frequency, control adjustments, and spare part sources.

1.05 QUALITY ASSURANCE

- A. Manufacturer: company specializing in overhead door construction with a minimum of five years' experience in work of this type.
- B. Applicator: company specializing in installing overhead doors with a minimum of five years' documented experience.
- C. Sectional overhead door construction: ANSI A216.1.
- D. Verify all measurements at the building site. Contractor shall be responsible for fitting and the proper attachment of items directly connected with the door installation.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for motor and motor-control requirements.

1.07 SYSTEM DESCRIPTION

- A. Electric-motor-operated unit with manual override in case of power failure.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Overhead coiling doors:
 - 1. Cookson Company
 - 2. Kinnear

3. Overhead Door Corp.

- C. Substitutions: Alternate products, equal in quality and utility to those specified may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS AND FABRICATION

- A. Sheet steel: ASTM A446, Grade A or ASTM A526; with a minimum yield strength of 33,000 (psi) and galvanized in accordance with ASTM A525; prime painted.
- B. Inside mounted lock, adjustable keeper, spring-activated latch bar with feature to keep in locked or retracted position; interior and exterior handle; lock keyed. See Section 08700.
- C. Provide continuous rubber, neoprene, or flexible-vinyl adjustable weatherstrip gasket at tops and compressible astragal on the bottoms of each overhead door. Provide continuous flexible seals at door jamb edges for a fully weathertight installation.
- D. Where door unit is power operated, provide safety interlock switch to disengage power supply.
- E. Overhead coiling doors:
1. Curtain of interlocking slats designed to withstand required wind loading and of continuous length for width of door without splices.
 2. Provide slats of material gauge recommended by door manufacturer for size and type of door required and as follows:
 - a. Malleable iron casting endlocks, galvanized after fabrication, and secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.
 - b. Malleable iron casting windlocks secured to curtain slats with galvanized rivets.
 - c. Bottom bar consisting of two steel angles, 1 1/2 inches x 1 1/2 inches x 1/8 inch thick, galvanized.
 3. Hardware: See Section 08700.

4. Insulate inner core of steel sections with manufacturer's standard polyisocyanurate-foam insulation.

2.03 ELECTRIC OPERATORS

- A. Furnish electric door operator assemblies of size and capacity recommended and provided by door manufacturer.
 1. Complete with electric motor and factory-prewired motor controls, gear reduction unit, solenoid operated brake, clutch, remote control stations, and control devices.
 2. See Section 16010.
- B. Provide hand-operated disconnect or mechanism for automatically engaging sprocket chain operator and releasing brake for emergency manual operation. Include interlock device to automatically prevent motor from operating when emergency sprocket is engaged.
- C. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
 1. Electric-door-operator selection dependent on size of door and type of operation.
 2. Provide gear-reduction trolley with worm and worm-gear reduction, enclosed running-in-oil primary drive, and chain or worm-gear secondary drive and quick-clutch release for manual operation.
 3. Provide 460 V, 3HP, high-starting torque, reversible, constant duty, Class-A, insulated electric motor with overload protection, sized to move door in either direction, from any position, and at not less than 8 inches or more than 1 foot per second.
 4. Provide momentary-contact, 3-button control station with push-button controls labeled "open", "close" and "stop".
 5. Furnish each door with automatic safety switch.
 - a. Extend full width of door bottom and locate within neoprene or rubber astragal mounted to bottom door rail.
 - b. Contact with switch must immediately reverse downward door travel.

- c. Furnish manufacturer's standard take-up reel or self-coiling cable.
- d. Provide electrically actuated automatic bottom bar.

2.04 FINISHES

- A. Pretreat zinc-coated steel with zinc-phosphate conversion coating after cleaning.
- B. Apply prime coats to interior and exterior door faces. See Section 09900.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within limits.
- B. Beginning of installation means acceptance of existing surfaces.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit and air- and vapor-barrier seal.
- B. Apply sealer.

3.03 INSTALLATION

- A. Install overhead doors with electric operators and controls in accordance with manufacturer's instructions. Coordinate installation with electric service.
- B. Install door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports in accordance with the project drawings, manufacturers' instructions, and as herein specified.
- C. Fasten vertical track assembly to framing at not less than 24 inches on centers. Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track- and door-operating equipment.
- D. Fabricate jamb guides of steel angles or channels and angles with sufficient depth and strength to retain door loading.

1. Build-up units with minimum 3/16 inch thick steel sections, galvanized after fabrication.
 2. Slot bolt holes for track alignment.
- E. Secure continuous wall angle to wall framing by 3/8 inch minimum bolts at not more than 30 inches on centers, unless closer spacing is recommended by door manufacturer.
1. Extend wall angles above door opening head as required.
 2. Place anchor bolts on exterior wall guides so they are concealed when door is in closed position.
 3. Provide removable stops on guides to prevent over-travel of door and a continuous bar for holding windlocks, if any.
- F. Space windlocks approximately 24 inches on centers on both edges of door.
- G. Upon completion of installation (including work by other trades) lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion. Doors shall have a weathertight fitting for the entire perimeter.

3.04 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Variation from plumb: 1/16 inch maximum.
- C. Variation from level: 1/16 inch maximum.
- D. Longitudinal or diagonal warp: $\pm 1/8$ inch from 10 foot long straight edge.

3.05 ADJUSTING AND CLEANING

- A. Adjust door assembly.
- B. Clean doors, frames, and glass.
- C. Remove labels and visible markings.

END OF SECTION

DIVISION 8
DOORS AND WINDOWS
SECTION: 08500
TITLE: WINDOWS

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SECTION 08500

WINDOWS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Steel and aluminum windows
- B. Framed insect screens
- C. Hardware and weatherstripping
- D. Glass and glazing

1.02 RELATED WORK

- A. Section 05500 - Miscellaneous Metals and Metal Fabrications
- B. Section 07600 - Flashing and Sheet Metal
- C. Section 07900 - Caulking and Sealants
- D. Section 08800 - Glass and Glazing
- E. Section 09900 - Painting

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM A36 Structural Steel
 - ASTM A164 Fasteners
 - ASTM B221 Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube
 - ASTM E163 Fire Test of Window Assemblies
 - ASTM E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors
 - ASTM E330 Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

ASTM E331 Water Penetration of Exterior Windows,
Curtain Walls, and Doors by Uniform
Static Air Pressure Difference

ASTM A386 Zinc Coating (Hot Dip) on Assembled
Steel Products

B. Federal Specification (FS):

FS RR-W-365 Wire Fabric (Insect Screening)

C. National Fire Protection Association (NFPA):

NFPA 80 Fore Door & Windows

D. Sealed Insulating Glass Manufacturers Association
(SIGMA):

SIGMA Glazing Requirements for Steel Windows

1.04 SUBMITTALS

A. Submit shop drawings, product data, samples, and
manufacturers' installation instructions. See Section
01300.

B. Shop drawings shall indicate the window framing,
elevation of each window, window details of
construction, method of assembling sections, location
and extent of hardware reinforcement, hardware locations
with handling listed, type and location of struts and
anchors for frames, and thicknesses of metal. Shop
drawings shall include catalog cuts or descriptive data
for the astragals. Finishes and appurtenant items shall
be shown. Glazing details shall be submitted.
Recommended backing material and trim aluminum and
masonry connections.

C. Submit samples of glazed window frame, corner, mullion
joint, operating sash, 12 x 3 inches in size
illustrating quality of joint, color, and texture of
finish and miscellaneous trim when requested by the
Department of Energy Contracting Officers Representative
(DOE/COR).

D. Submit manufacturer's certificate that products meet or
exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: company specializing in hot rolled steel
or aluminum window manufacturing with five years'
minimum experience.

- B. Installer: company licensed or franchised by window manufacturer, with five years' minimum experience.

1.06 SYSTEM PERFORMANCE

- A. Water penetration of operable sash: none when subjected to ASTM E331 under static pressure 2.86 pounds per square foot for 15 minutes.
- B. Wind and suction loads when acting normal to plane of window: in accordance with applicable code and measured in accordance with ASTM E330.
- C. Deflection: 1/175 of span maximum when subjected to ASTM E330 with wind and suction loads acting normal to plane of window, measured on any window framing unit.
- D. Thermal movement: design sections to permit thermal expansion and contraction caused by a cycling temperature range of 180 degrees F over a year season contrast to infill or perimeter opening construction.
- E. Limit air infiltration through assembly to 0.06 cubic foot per minute per square foot of assembly surface area, as measured in accordance with ASTM E283.

1.07 WARRANTY

- A. Provide ten year manufacturer's warranty covering complete window system for failure to meet specified requirements.
- B. Warranty: include coverage of insulating glass units from seal failure, interpane dusting or misting, and replacement of same.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered, and stored (off the ground) in manufacturers' wrapping to protect surfaces and shall be protected from all damage. Damaged materials shall not be installed on the project.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Steel Windows:
 - 1. A & S Window Associates
 - 2. Bliss Cashier Metal Products, Inc.

3. De Vac.

B. Aluminum windows:

1. Disco Aluminum Products Co., Inc.
2. EFCO Corp.
3. REBCO, Inc.
4. Win Vent, Inc.

C. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the DOE/COR. See Section 01600.

2.02 ALUMINUM WINDOWS

- A. Steel: ASTM A36; hot rolled to form sash section, in accordance with ASTM A386; with slot for fitting weatherstripping integral with sash section.
- B. Frames and trim moldings shall be extruded of 6063-T5 aluminum alloy and temper (ASTM B221 alloy G.S. 10A-T5). All screws and miscellaneous fasteners shall be aluminum, stainless steel or zinc plated steel in accordance with ASTM A164 to match adjacent material.
- C. Extruded aluminum sections shall be of 6063-T5 alloy and temper and in all cases, fall within commercial tolerances and be free from defects impairing strength, durability or appearances. All extruded rails shall have a minimum wall thickness of .125 inch.
- D. Anchors, clips and window accessories: fabricate units of aluminum, non-magnetic stainless steel, or hot-dip zinc-coated steel complying with ASTM A386.
- E. Sealant: unless otherwise indicated for sealants required within fabricated window units, provide type recommended by window manufacturer for joint size and movement to remain permanently elastic, non-shrinking and non-migrating. Comply with Section 07900 for installation of sealants.
- F. Screening: 14/18 mesh, aluminum strands.
- G. Weatherstripping: flexible neoprene type.

2.03 INTERIOR WINDOWS

- A. Frames shall be of extruded 6063-T-S aluminum alloy and temper ASTM B221, alloy GS 10A-T5, falling within commercial grade A-2 tolerances and free from defects impairing strength, durability and appearance and a minimum wall thickness required for labeled, Fire Rated Frame.
- B. Glass shall be labeled 1/4 inch polished wire glass with permanent etched mark Underwriters Laboratories (UL) and shall be free of chips, flaws and warp. See Section 08800.

2.04 STEEL WINDOWS

- A. Steel windows shall conform to SWI publication, Recommended Specifications for Steel Windows (1977).
- B. Fixed lite windows: fixed window frames to be provided with 3/4 x 3/4 inch metal glazing stops.
- C. New steel window frames shall be cleaned, properly treated, and prime painted after fabrication or prior to installation. At the option of the Contractor, window frames may be furnished with the finish paint in lieu of field painting.
- D. Painting shall match door frames for finished materials. See Section 09900.

2.05 FABRICATION

- A. Fabricate framing, mullions, and sash members with reinforced corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
- B. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- C. Form glass stops, exterior sills, closure trim, weather-stops, and flashings of same material as window for tight fit into window frame section.
- D. Assemble insect screens of rolled aluminum rectangular sections with mesh set into frame and secured. Fit frame with 4 spring-loaded pin retainers.

- E. Size window units to allow for tolerances of rough framed openings, clearances, and shim spacing around perimeter of assemblies.
- F. Double weatherstrip operable units.
- G. Apply bituminous paint to concealed metal surfaces in contact with cementitious surfaces or dissimilar metals.

2.06 PREFINISHING

- A. Window frames: prime-painted or baked enamel finish, as indicated on the window schedule of contract drawings.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify rough openings are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of window unit and air and vapor seal.

3.03 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Maintain alignment with adjacent work. Secure assembly to framed openings without distortion or stress.
- C. Ensure air and vapor barrier is sealed to window frame. Coordinate placement of insulation in shim spaces around unit perimeter as specified in Section 07213.
- D. Install sealant and related backing materials at exterior and interior of installed assembly as specified in Section 07900.
- E. Install perimeter trim and closures.
- F. Install glass as specified in Section 08800.
- G. Adjust operating sash.

3.03 TOLERANCES

- A. Variation from plumb and level: 1/8 inch maximum.
- B. Variation from longitudinal or diagonal warp: 1/8 inch maximum.

3.04 ADJUSTING AND CLEANING

- A. Adjust window operating hardware.
- B. Remove labels and visible markings.
- C. Clean window frames and glass.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

SECTION: 08700

TITLE: BUILDER'S HARDWARE

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SECTION 08700

BUILDER'S HARDWARE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Hinges
- B. Lock cylinders and keys
- C. Lock and latch sets
- D. Bolts
- E. Exit devices
- F. Push/pull units
- G. Closers
- H. Overhead holders
- I. Door control devices
- J. Door trim units
- K. Protection plates
- L. Thresholds

1.02 RELATED WORK

- A. Section 08100 - Metal Doors and Frames
- B. Section 13121 - Pre-Engineered Buildings

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - ANSI A156.1 Butts and Hinges
 - ANSI A156.2 Locks and Lock Trim
 - ANSI A156.3 Exit Devices
 - ANSI A156.4 Door Controls and Closers

NFPA 101 Code for Safety to Life from Fire in
Buildings and Structures

F. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

- A. Submit schedule, shop drawings, product data, samples, manufacturers' parts lists, templates, and installation instructions. See Section 01300.
- B. Indicate locations and mounting heights of each type of hardware.
- C. Submit samples illustrating style, color, and finish. Samples may be incorporated into the project.
- D. Submit manufacturer's certificate under provisions of Section 01400 that fire rated hardware meets or exceeds specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturers: companies specializing in manufacturing door hardware with minimum five years' experience.
- B. Hardware supplier: company specializing in supplying commercial door hardware with five years' experience and approved by manufacturer.
- C. Certificate of compliance: 4 copies of the certificates of compliance attesting that hardware items conform to the ANSI or BHMA standards under which the items are specified shall be submitted. A statement that the proposed locks and latches appear in the BHMA Directory of Certified Locks and Latches may be submitted in lieu of certificates.
- D. Hardware schedule: hardware schedule shall list all of the materials to be furnished and shall be submitted for approval. The schedule shall include for each item, the quantities, manufacturer's catalog numbers, hinge and door closer sizes, detail information, location and hardware set identification, corresponding ANSI or BHMA standard type and function number corresponding to manufacturer's catalog number, handing and list of abbreviations and template numbers.
- E. Keying schedule: keying schedule shall be submitted for approval and shall be developed in accordance with DHI KEY. Best locksets and key cylinders are now in use.

1.06 COORDINATION

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01700.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. See Section 01600.
- B. Store and protect products. See Section 01600.
- C. Package hardware items individually; label and identify package with door opening code to match hardware schedule.
- D. Deliver keys to the Department of Energy Contracting Officers Representative (DOE/COR) by security shipment direct from hardware supplier.
- E. Protect hardware from theft by cataloging and storing in secure area.

1.09 WARRANTY

- A. Provide five year warranty. See Section 01700.
- B. Warranty: include coverage of door closers.

1.10 EXTRA STOCK

- A. Provide ten extra key lock cylinders for each master keyed group under provisions of Section 01700.

1.11 MAINTENANCE MATERIALS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

- A. Best Locks
- B. Sargent
- C. Schlage Lock
- D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the DOE/COR. See Section 01600.

2.02 FINISHES

- A. Unless otherwise specified, finishes shall conform to those identified under BHMA 1301, Class A, for mill finish aluminum/stainless steel/cast aluminum, matching materials. Where painting of primed surfaces is required, painting is specified in Section 09900.
- B. Hinges shall have the following finishes:
 - 1. No. 630 for interior door hinges on in-swinging and out-swinging exterior doors.
- C. Lock and door trim shall have the following finishes:
 - 1. Number 626D for entrance door locks and trim.
 - 2. No. 626 or 630 for other door locks and trim.
- D. Door closer finishes shall be painted (sprayed) aluminum to match adjacent hardware finishes, No. 689 or approved equal.

2.03 FASTENINGS

- A. Fastenings of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete, stone, or other masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel, as applicable. Sex bolts, through bolts, or machine screws and grommet nuts, where used for surface hinges, shall employ one-way screws or other approved tamperproof screws. Screws for the jamb leaf of half-mortise and full-surface hinges attached to structural steel frames shall be the one-way type or other approved tamperproof type.

2.04 HARDWARE FOR FIRE DOORS

- A. Hardware for fire doors shall conform to the requirements of NFPA 80 and NFPA 101. All hardware for fire doors shall be UL listed/FM approved for the fire rating required.

2.05 LOCKS AND LATCHES

- A. To the maximum extent possible, locksets, latchsets, and deadlocks shall be the products of a single manufacturer.
- B. Cylinder locks: cylinders shall have six pins with paracentric keyways. Cylinders and the locks in which they are used shall be Best locks and shall have removable cores. Locks shall be installed so that when the key is inserted into the knob, the cuts on the key will face upward. Schlage locksets and key cylinders are now in use at the existing facilities.
- C. Locksets and latchsets: ANSI A156.2; Series 1000, Grade 2, Series 4000, Grade 1.
- D. Deadlocks: deadlocks shall conform to ANSI A156.5, mortise type, cylinder operated, E16000 series.
- E. Roller latches: BHMA 1201, Type L27082.
- F. Padlocks: padlocks shall conform to FS FF-P-101, Type E18101.

2.06 EXIT DEVICES AND ACCESSORIES

- A. Exit devices and accessories shall conform to ANSI A156.3.
 - 1. Exit devices, single leaf: exit devices shall be Type 3, Grade 1.
 - 2. Double leaf, exit devices shall be Type 3, Grade 1. Finish to match adjacent trim.

2.07 KEYING

- A. Key cylinder locks in sets or subsets as scheduled. Furnish cylinder locks with manufacturer's standard construction master key system. Stamp keys for cylinder locks with change number and the inscription "U.S. Property - Do Not Duplicate". Supply as follows:

Cylinder locks:	2 change keys each lock
Master keyed sets:	6 keys each
Construction master keys:	12 total (listed numbers)
Core control:	2 total

- B. Mechanical rooms shall be keyed separate from the master key system. Storage rooms shall be keyed to construction master sets only.
- C. The keys shall be properly tagged and designated as to door location, arranged in a container E-8341-BHMA for key control system storage in sets or subsets as scheduled, and turned over to DOE/COR at acceptance of building.

2.08 HARDWARE SETS

- A. Active leaf: right-hand leaf walking through opening in direction of door swing.
- B. Hardware: provide at each door to meet conditions required
 - 1. Manufacturer numbers shown for comparison only. Equals may be substituted with approval of the DOE/COR.

2.09 HINGES AND BUTTS

- A. Hinges shall conform to ANSI A156.1. Hinges used on metal doors and frames shall also conform to ANSI A156.7. Hinge sizes shall conform to the hinge manufacturer's printed recommendations and shall be indicated on the hardware schedule. Provide 2 hinges for doors up to 5 feet high, 3 hinges for door from 5 feet to 7 feet 6 inches and one additional hinge for every additional 30 inches or fraction thereof in height.
- B. Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means of a set screw in the barrel, or safety stud, when the door is in the closed position.
- C. Firedoor hinges shall be in accordance with NFPA 80, NFPA 80A, and NFPA 101.
- D. Outswinging exterior door hinges with closers: Type A8111, NRP, Grade 1.

2.10 DOOR CLOSING DEVICES

- A. Door closing devices of the following types shall conform to ANSI A156.4.
- B. Surface type closers: surface type closers shall be Series C02000. Mounting details for the type closers specified shall be in accordance with Paragraph 2.08, Hardware Sets. Size requirements shall conform to the manufacturer's published recommendations and shall be shown on the hardware schedule. Closers for interior doors shall have parallel arms.

2.11 MISCELLANEOUS

- A. Metal thresholds: thresholds for exterior metal doors with seals and weather stripping shall be extruded aluminum type with fluted top and shall provide proper clearance and an effective seal with specified weather stripping.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 TEMPLATES

- A. Templates or other information shall be furnished to enable the door-frame manufacturer to provide for the specified hardware. Where two or more articles of hardware are to be mounted on the same door, proper coordination shall be effected between the manufacturers of the different articles. Templates of hinges shall conform to ANSI A156.7.

3.03 PACKING, MARKING, AND LABELING

- A. Hardware shall be delivered to the project in the manufacturers' original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, properly marked or labeled so as to be readily identifiable with the approved hardware schedule. Each change-key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of the door, appropriate instructions shall be included with the lock and on the hardware schedule for indicating the handing.

3.04 APPLICATION

- A. Hardware shall be located on doors in accordance with DHI LOCN. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI.
- B. Hardware for labeled fire doors: hardware for beveled fire doors shall be installed in accordance with the requirements of NFPA Nos. 80 and 101.
- C. Door-closing devices: door closing devices shall be installed and adjusted in accordance with the templated and printed instruction supplied by the manufacturer of the devices. Insofar as practicable, doors opening to or from halls or corridors shall have the closer mounted on the room side of the door. Door closers shall be secured to doors by sex bolts.
- D. Auxiliary hardware: wall type bumper; L-12111-US26D.
- E. Door signs and name plates: provide as required on all rooms and doors listed below using laminated plastic having core and surface of white letters and brown background, letters minimum of 1 1/4 inches height.
 - 1. Letters of wording shall run across width of sign surface plate. Edges of plate shall be beveled to leave no sharp edge. Letters shall be etched, or depressed characters. Attachment shall be by flush headed screws.
 - 2. Sign wording includes the following:
 - a. Room number of all spaces as listed on floor plans or room finish schedules except corridors, vestibules, storage bays and secretary.
 - b. Fire extinguisher (OSHA requirements).

END OF SECTION

DIVISION 8
DOORS AND WINDOWS

SECTION: 08800

TITLE: GLASS AND GLAZING

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SECTION 08800

GLASS AND GLAZING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Glass and glazing for doors and windows
- B. Glass for mirror frames

1.02 RELATED WORK

- A. Section 07900 - Caulking and Joint Sealants
- B. Section 08100 - Metal Doors and Frames
- C. Section 08215 - Prefinished Wood Doors
- D. Section 08500 - Windows
- E. Section 10800 - Toilet Accessories

1.03 REFERENCES

- A. Code of Federal Regulations (CFR) 16CFR:
 - CPSC 1201 Safety Standard for Architectural Glazing Materials
- B. Federal Specifications (FS):
 - FS DD-G-451D Glass, Float or Plate, Sheet, Figured (Flat, for Glazing, Mirrors and Other Uses)
 - FS TT-S-227E Sealer Compound: Rubber Base, Two Component (for Caulking, Sealing and Glazing in Building Construction)
 - FS TT-S-230C Sealing Compound: Synthetic Rubber Base, Single Component, Chemically Curing for Caulking, Sealing and Glazing in Building Construction
 - FS TT-S-1543A Sealing Compound: Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures)

FS TT-S-001657 Sealing Compound: Single Component,
Butyl Rubber Based Solvent Release Type
(for Buildings and Other Types of
Construction)

C. Flat Glass Marketing Association (FGMA):

FGMA MAN Glazing Sealing Systems Manual

1.04 SUBMITTALS

- A. Submit product data and samples. See Section 01300.
- B. Provide structural, physical, and environmental characteristics; size limitations; and special handling or installation requirements.
- C. Provide data on glazing sealant. Identify colors available.
- D. Submit sealed glass unit manufacturer's certificate indicating that units meet specified requirements.

1.05 QUALITY ASSURANCE

- A. Watertight and airtight installation of each glass product is required, except as otherwise shown on the Drawings.
 - 1. Each installation must withstand the following stresses:
 - a. Normal temperature changes.
 - b. Wind loading.
 - c. Impact loading (for operating sash and doors) without failure including loss or breakage of glass.
 - d. Failure of sealants or gaskets to remain watertight and airtight.
 - e. Deterioration of glazing materials.
 - f. Other defects in the work.
- B. Protect glass from edge damage during handling and installation and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

- C. Glazing channel dimensions are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site and store off the ground in manufacturer's wrapping to protect surfaces.
 - 1. Protect materials from all damage.
 - 2. Damaged materials shall not be installed on the Project.
- B. Store and protect products. See Section 01600.

1.07 WARRANTY

- A. Provide ten year manufacturer's warranty on maintained hermetic seal.
- B. Include coverage of sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. American Flat Glass
- B. Pittsburgh Plate Glass Industries, Inc.
- C. Libbey-Owens-Ford Co.
- D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

- A. Glass shall be of the following types, qualities, and thicknesses and shall conform to FS DD-G-451D. In doors and certain glazed panels, provide safety glazing materials as defined in CPSC 1201.
- B. Wire glass: 1/4 inch wire glass conforming to CPSC 1201 for interior windows and doors, where indicated on the Drawings.

- C. Tempered, laminated, 3/16 inch, polished both surfaces shall be used at the exit doors and adjacent vestibule glazed areas.
- D. Laminated safety glass: laminate 2 sheets of clear float glass with a 30 mil film of polyvinyl buteral by manufacturer's standard heat-plus-pressure process with dirt, air pockets, and foreign substances excluded; 1/4 inch thick for exterior door and sidelight at vestibule.
- E. Insulating glass: provide 2 sheets of glass as follows and dry air or gas-filled space (1/2 inch or as indicated on the Drawings) with 20 degrees F dew point; with Class A sealant-type edge construction to maintain a hermetic seal; and fabricated to provide the following overall performance characteristics.
 - 1. Exterior glass, laminated, color bronze. See Paragraph 2.02.D.
 - 2. Interior glass, laminated. See Paragraph 2.02.D.
 - 3. Edge construction:
 - a. Twin primary seals of polyisobutylene
 - b. Tubular aluminum or galvanized steel spacer-bar frame with welded or soldered sealed corners and filled with dessicant.
 - c. Secondary seal outside of bar bonded to both sheets of glass and bar and made of polysulfide, silicone, or hot-melt butyl elastomeric sealant (fabricator's option).
- F. Mirror glass: number 1 quality, 1/4 inch plate, floatglass mirror, electrolytically copper plated and back-primed painted black.
- G. Resilient setting blocks, shims, clips, springs, spacers, angles, and vinyl or neoprene plastic channels required for setting multiple pane units (unless otherwise provided for) shall be installed in accordance with the approved written instruction of the insulating unit glass manufacturer.
- H. Elastomeric sealant: FS TT-S-227E; FS TT-S-230C; FS TT-S-1543A; FS TT-S-001657, Type II, Class A or B. Use for channel or stop-glazing metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes.

H&N SPECIFICATION
HNNWSI-08800.A

- I. Preformed channels: neoprene, vinyl, or rubber; NAAMM SG-1, as recommended by the glass manufacturer for the particular condition.
- J. Setting blocks and edge blocks: neoprene of 70 to 90 Shore "A" durometer hardness, chemically compatible with sealants used and of sizes recommended by the glass manufacturer.
- K. Accessories: as required to provide a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips.
 - 1. Provide non-corroding metal accessories.
 - 2. Provide primer sealers and cleaners as recommended by the glass and sealant manufacturers.
- L. Setting materials: provide setting materials of the types required for the applicable setting method specified in the FGMA MAN, unless specified otherwise herein.
 - 1. Do not use metal sash putty, non-skinning compounds, non-resilient preformed sealers or impregnated preformed gaskets.
 - 2. Materials which will be exposed to view and unpainted shall be gray or neutral color.
- M. Glazing accessories
 - 1. Standard corrosion resistant glazing points, wire springs, and setting shims shall be provided as required.
 - 2. Special shims, clips, springs, angles, beads, and attachment screws required for special units shall be furnished by the unit manufacturer and installed in accordance with the manufacturer's installation instructions.
 - 3. Mirror mounting accessories shall consist of toggle bolts or other types of fastening devices as required by the construction.
 - a. Install mirrors in toilet and washrooms not more than 54 inches from the floor to the bottom of the mirror and centered on the lavatory drains.
 - b. Attach mirrors securely to anchors only after the location has been painted and cleaned.

PART 3 EXECUTION

3.01 GENERAL

- A. The sizes of glass shown on the Drawings are approximate.
1. The sizes and proper edge clearances, as specified in Tables 54A, B, and C of the Uniform Building Code, shall be determined by measuring the actual unit to receive the glass.
 2. Except where specified otherwise, each piece of glass shall bear the manufacturer's label to identify its type, as well as thickness and quality.
 3. Labels shall not be removed until final approval by the DOE/COR.

3.02 GLASS SETTING

- A. Items to be glazed shall be either shop or field glazed using glass of the quality and thickness specified or indicated.
1. Preparation and glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the FGMA MAN in accordance with the manufacturer's instructions.
 2. Use beads or stops which are furnished with the items to be glazed to secure the glass in place.
- B. Set glass in a single light fixed metal frames in continuous vinyl or neoprene plastic channels and secure with metal beads attached with countersunk flathead screws, spaced approximately 5 inches on centers.

3.03 ENVIRONMENTAL CONDITIONS

- A. Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless approved provisions are made to warm the glass and rabbet surfaces.
1. Provide sufficient ventilation to prevent condensation of moisture on glazing work during installation.
 2. Do not perform glazing work during damp or rainy weather.

3.04 PRECAUTIONS AND PROCEDURES

- A. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass.
 - 1. Grind smooth all edges of glass that will be exposed in finish work.
 - 2. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.05 GLAZING IN METAL

- A. Use elastic glazing compound for glazing in steel.
- B. Use a glazing compound having a composition and color particularly adapted for aluminum and requiring no painting for glazing in aluminum.
- C. Glass panes, unless secured with screwed-on or snap-in beads furnished with the unit, shall be secured with not less than eight applicable glazing or wire springs.
 - 1. Neatly face putty.
 - 2. Seat glass firmly into the previously bedded and back bedded rabbet.
 - 3. Attach manufacturer's specified number of clips or springs, equally spaced on all four sides to keep the glass from shifting.
 - 4. The rabbet shall then be filled with glazing compound, beveled back against the metal members, and cut to a neat trim line.
- D. Beads, other than snap-in types, shall be attached with applicable length countersunk flathead screws set approximately 5 inches on centers. Provide a positive seal between glass and metal on both sides of the glass.
- E. Except where vinyl or neoprene channels are used in connection with glazing beads, glass installed in aluminum units shall rest on plastic shims or separators not less than 1/8 inch thick.
- F. If glass lights are more than 100 square inches or have a 36 inch dimension and are in movable units without beads, secure glass with equally spaced angle glazing clips fastened to metal members with applicable metal screws.

3.06 RABBETS AND BEADS

- A. Rabbets and beads of galvanized, bonderized, or factory coated metal units shall be thoroughly cleaned but require no painting before glazing.

3.07 REPLACEMENT AND CLEANING

- A. Upon completion of the work, thoroughly clean all glass surfaces of any labels, paint spots, and putty and remove other defacements. Replace all cracked, broken, and imperfect glass.

END OF SECTION

DIVISION 9

FINISHES

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DIVISION 9

FINISHES

SECTION: 09111

TITLE: METAL STUD FRAMING, FURRING AND LATHING SYSTEMS

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SECTION 09111

METAL STUD FRAMING, FURRING, AND LATHING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Formed metal stud framing
- B. Framing accessories
- C. Wall and furred space framing

1.02 RELATED WORK

- A. Section 05400 - Cold Formed Metal Framing
- B. Section 06001 - Carpentry
- C. Section 07200 - Insulation
- D. Section 07900 - Caulking and Joint Sealants
- E. Section 08100 - Metal Doors and Frames
- F. Section 09210 - Gypsum Plaster
- G. Section 09220 - Portland Cement Plaster
- H. Section 09260 - Gypsum Board Systems
- I. Section 09511 - Suspended Ceiling Systems

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM C754 Installation of Steel Framing Members to
Receive Screw-Attached Gypsum Wallboard,
Backing Board, or Water-Resistant
Backing Board

- B. Federal Specification (FS):

FS QQ-S-698 Steel Sheet and Strip, Low Carbon

FS QQ-S-700D Steel Sheet and Strip, Medium
and High Carbon

FS QQ-S-775E Steel Sheets, Carbon, Zinc Coated
(Galvanized) by the Hot Dip Process

FS QQ-W-461G Wire, Steel, Carbon (Round, Bare, and
Coated)

C. Gypsum Association (GA):

GA 203

D. International Conference of Building Officials (ICBO)

1.04 SUBMITTALS

- A. Submit shop drawings, product data, and manufacturer's installation instructions. See Section 01300.
- B. Submit shop drawings of prefabricated work indicating component details, stud layout, framed openings, anchorage to structure, type and location of fasteners, and accessories or items required for related work.
- C. Describe methods for securing studs to tracks, splicing, blocking, and reinforcement to framing connections.
- D. Submit product data describing standard framing member materials and finish, product criteria, load charts, and limitations.
- E. Provide product data on furring and lathing components, structural characteristics, material limitations, and finish.
- F. Submit two 9 inch x 9 inch samples illustrating component design, material, and finish.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with GA 203 and ASTM C754.
- B. Maintain one copy of each submittal document on site.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence work under the provisions of Section 01005.
- B. Sequence work with other work directly affected by this Section.
- C. Coordinate work under provisions of Sections 01005.
- D. Coordinate the work of related sections.

- E. Coordinate the work of this section with installation of hollow metal frames.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. United States Gypsum Company (USG)
- B. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 FABRICATION

- A. All materials fabricated under this section shall conform to the applicable specifications and requirements.
- B. Studs for wall framing shall be formed from steel sheets conforming to FS QQ-S-698 and galvanized or coated with manufacturer's standard protective coating.
 - 1. Studs shall be C-shaped, not less than 25 gauge thickness with web dimension of 3 5/8 inches for wall framing and 1 1/2 inch or 2 1/2 inches, as shown on drawings.
 - 2. Stud flanges shall be not less than 1 5/16 inches wide.
 - a. Each flange shall have a stiffening lip, bent parallel to the stud web.
 - b. Stiffening lips shall be at least 1/4 inch wide with turned or folded edges.
 - 3. Studs shall be color coded.
- C. Where required for utility lines and wires, stud webs shall have preformed holes or knockouts.
 - 1. Holes or knockouts shall be centered on the longitudinal axis of the web and spaced not less than 6 inches on center.
 - 2. Holes or knockouts for typical studs shall be not more than 1 1/2 inches across the longitudinal axis and not larger than 3 square inches.
 - 3. Holes or knockouts for 1 1/2 inch studs shall be not more than 1 1/8 inch across the longitudinal axis and not larger than 1 1/2 square inches.

- D. Channels shall be formed from steel sheets conforming to FS QQ-S-700D or FS QQ-S-775E, as applicable. Channels shall be galvanized or coated with manufacturer's standard protective coating.
1. Ceiling and floor runner channels shall be not less than 25 gauge thickness with 1 1/4 inch flanges. The channel web shall be sized to nest with comparable steel studs.
 2. Main runner channels shall be 1 1/2 inch hot or cold-rolled steel.
 - a. Hot-rolled channels shall weigh not less than 1.12 pounds per linear foot.
 - b. Cold-rolled channels shall be not less than 16 gauge thickness with flanges at least 19/32 inch wide.
- E. Accessories:
1. Hangers supporting main runner channels shall be soft steel wire, 8 gauge, zinc coated, and conforming to FS QQ-W-461G, Class 2.
 - a. Flat steel hangers may be substituted for wire hangers.
 - b. Flat steel hangers shall be 1 inch by 3/16 inch, zinc coated.
 2. Tie wires for splicing or securing furring channels to main runner channels or to structural members shall be 16 gauge galvanized steel.
- F. Tolerances shall be those specified in the applicable material specifications and ICBO reports for the materials supplied.

2.03 LATHING MATERIALS AND ACCESSORIES

- A. Anchorages: tie wire, nails, screws, and metal supports to suit application.
- B. Corner beads: formed steel, 26 gauge minimum; beaded edge; of longest possible length; sized and profiled to suit application; galvanized finish.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that supporting structure is ready to receive work.
- B. Verify field measurements.
- C. Verify that roughed-in utilities are in proper location.
- D. Beginning of installation means Contractor and Installer accept existing conditions.

3.02 INSTALLATION

- A. Non-load-bearing walls and partitions shall be framed with 3 5/8 inch studs and runners unless shown otherwise on the Drawings.
- B. Studs shall be spaced not more than 16 inches on center.
 - 1. Studs shall be installed in continuous lengths with no splices.
 - 2. Studs shall be positioned plumb in ceiling and floor runners. Attach each stud to runners with one #10 by 1/2 inch sheet metal screw or one 1/8 inch pop rivet on each side of each end.
 - 3. Additional studs shall be installed at partition intersections and jamb openings.
 - 4. End studs in adjoining walls shall be interconnected with screws spaced not more than 24 inches on center.
 - 5. Doubled studs at jamb openings shall be 3 5/8 inch by 20 gauge and shall be bolted together with 3/8 inch bolts or screwed together with 1/2 inch sheet metal screws at 24 inches on center.
- C. Floor and ceiling runners shall be accurately aligned and securely attached to floors and to roof deck.
 - 1. Attachment shall be by expansion shields, machine bolts, or other approved devices spaced 24 inches maximum on center.
 - 2. Where partition ceiling runners are applied directly to furred ceilings, attachment shall be by wallboard screws to each furring member.

- a. Where ceiling runners are parallel to the furring members, provide additional furring perpendicular to the principal furring members.
3. At the ends of open-ended partitions, runners shall be bent, nested with the stud, and attached to the stud with two wallboard screws.
4. Runners shall be the longest lengths possible with butt joints at splices.
- D. Framing for special items shall be built to the shapes or forms indicated. Secure each intersection rigidly with wallboard screws.

3.03 FRAMING OPENINGS

A. Ceiling openings

1. Support members shall be provided at ceiling openings for access panels, recessed light fixtures, and air supply and exhaust registers.
2. Extra members shall be located for furring support and wallboard attachment.
3. Additional structural members shall be provided for attachment or suspension of support members.

B. Wall openings

1. Frames shall be provided for doors, pass-through openings, and access panels.
2. Steel frames are specified in Section 08100.

3.04 WALL BRACING

- A. Steel frames shall be securely attached with wallboard screws to the nearest studs on each side of the openings.
- B. A ceiling runner section shall be installed horizontally over the framed opening. Runner ends shall be bent, nested with the stud, and attached to the stud with two wallboard screws.
- C. Partitions abutting continuous suspended ceilings shall be strengthened at openings more than 30 inches wide.
 1. Provide angle braces above each jamb and anchored to the deck supports.

2. Cross bracing between partitions or similar bracing may be substituted for angle bracing with the approval of the DOE/COR.

3.05 FURRED CEILING SYSTEMS

- A. Ceiling framing shall consist of 1 1/2 inch steel channels suspended from open-web steel joists using hanger wires or straps spaced not more than 4 feet on center.
 1. Hanger wires shall be looped around bottom chords of open-web steel joists and shall be twisted three full turns.
 2. Hanger wires shall be saddle tied to channels and shall be twisted three full turns.
 3. Each hanger strap shall be hung plumb, bent around structural framing, and connected to itself with one 3/8 inch galvanized bolt.
 4. Each hanger strap shall be bent under channel to form a stirrup and bolted through the channel with one 3/8 inch galvanized bolt.
- B. Channels shall be located within 6 inches of parallel walls and cut 1/2 inch short of abutting walls.
- C. Interlock channels at splices.
 1. Tie each end of the splice with two loops of wire.
 2. Splices shall be staggered.
 3. Lap 12 inches at splices in 1 1/2 inch channels.
 4. Lap 8 inches at splices in 3/4 inch channels.

3.06 TOLERANCES

- A. Maximum variation from true lines and levels:
1/8 inch in 10 feet.
- B. Maximum variation from true position: 1/8 inch.

END OF SECTION

DIVISION 9

FINISHES

SECTION: 09260

TITLE: GYPSUM BOARD SYSTEMS

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SECTION 09260

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Metal stud wall framing
- B. Metal channel ceiling framing
- C. Acoustic insulation
- D. Gypsum board
- E. Fire-rated assemblies
- F. Furred beams and soffits

1.02 RELATED WORK

- A. Section 05400 - Cold Formed Metal Framing
- B. Section 06001 - Carpentry Work
- C. Section 07200 - Insulation
- D. Section 08100 - Metal Doors and Frames
- E. Section 09111 - Metal Stud Framing, Furring, and Lathing Systems
- F. Section 09900 - Painting

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM D822 Standard Practice for Operating Light and Water Exposure Apparatus (Carbon Arc Type) for Testing Paint and Related Coatings and Materials
- B. Federal Specification (FS):
 - FS QQ-S-775 Steel Sheets, Carbon, Zinc Coated (Galvanized) by the Hot-Dip Process
 - FS SS-L-30D Gypsum Board, Regular and Fire Resistant

- C. Gypsum Association (GA):
 - GA 216 Recommended Specifications for the Application and Finishing of Gypsum Board
- D. International Conference of Building Officials (ICBO):
 - UBC Uniform Building Code
- E. Painting and Decorating Contractors Association (PDCA):
 - PDCA MAN Painting Specification Manual
- F. National Fire Protection Association (NFPA):
 - NFPA 101 Life Safety Code
- G. Underwriters Laboratories Inc. (UL).

1.04 SUBMITTALS

- A. Submit shop drawings, product data, and manufacturers' installation instructions. See Section 01300.

1.05 QUALITY ASSURANCE

- A. Applicator: company specializing in gypsum board system application with a minimum of three years' experience in work of this type.

1.06 REGULATORY REQUIREMENTS

- A. Conform to the requirements of UBC and NFPA 101 for fire rated assemblies.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Gold Bond
- B. Georgia Pacific
- C. United States Gypsum Company (USG)
- D. Flintkote
- E. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

- A. Adhesives shall be the types recommended by the manufacturer. Adhesives containing asbestos fibers will not be permitted.
- B. Joint and fastener concealment:
 - 1. Embedding compound for first and second coats.
 - 2. Finishing compound for final coat.
- C. Dust membrane shall be a non-reinforced, homogeneous, waterproof sheeting compound of elastomeric substances that have been reduced to a thermoplastic state and extruded into continuous sheeting not less than 30 mils thick.
 - 1. Sheeting shall be suitably stabilized to resist exposure without visible deterioration when tested not less than 400 hours in accordance with ASTM D822.
 - 2. The material shall show no cracking or flaking when, at a temperature of minus 20 degrees F, the material is bent through 180 degrees over a 1/32 inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction through 360 degrees.
- D. Fasteners:
 - 1. Screws for wallboard attachment shall be shouldered flathead design for use with special power driven tools.
 - 2. Screws shall have self-tapping threads and self-drilling points.
 - a. Use 1 inch length for single layer of wallboard.
 - b. Use 1 5/8 inch length for double layer of wallboard.
- E. Gypsum wallboard shall conform to FS SS-L-30D, Type III, Class 1, Style 3, taper edged.
 - 1. Regular gypsum wallboard shall be 5/8 inch minimum thick.
 - 2. Fire retardant wallboard shall be Grade X, Form A, 1/2 or 5/8 inch thick as noted on the Drawings.

3. Wallboard shall be supplied in 48 inch widths and in such lengths as will result in a minimum of joints.
 4. Aluminum foil backed gypsum wallboard, Type III, Grade R, Class I, Form C, or Grade X, fire retardant, 1/2 or 5/8 inch thick where indicated on the Drawings.
 5. Moisture resistant gypsum wallboard, either regular, fire retardant, or foil backed, 1/2 or 5/8 inch thick where indicated on the Drawings.
- F. Metal trim features for wallboard shall be formed from zinc coated steel not lighter than 26 gage and shall conform to FS-QQ-S-775, Type I, Class D or E. Metal trim shall be in the following shapes and sizes:
1. Casing beads shall be channel shaped with a concealed wing not less than 7/8 inch wide and an exposed wing. Exposed wing may be covered with paper cemented to metal and shall be suitable for joint treatment.
 2. Corner beads shall be angle shaped with:
 - a. Metal wings: 7/8 inch wide and perforated for nailing and joint treatment.
 - b. Combination wings: metal and paper bonded together, 1 1/4 inches wide, and suitable for joint treatment.
 3. Edge beads for use at perimeter of ceilings shall be angle shaped with wings not less than 3/4 inch wide.
 - a. Concealed wings shall be perforated for nailing.
 - b. Exposed wing edge shall be folded flat.
 - c. Exposed wings may be factory finished in a white color.
- G. Reinforcing tape recommended by manufacturer of wallboard.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on the Drawings.

- B. Mechanical and electrical: verify that services within walls have been tested and approved.
- C. Beginning of installation means Contractor and Applicator accept existing surfaces and substrate.

3.02 DELIVERY AND STORAGE

- A. Wallboard delivered prior to use shall be stored within a completely enclosed structure or off the ground and completely enclosed within a weathertight covering.
- B. Wallboard shall be dry, free of warpage, and have bundling tape intact immediately prior to use.

3.03 APPLICATION

- A. Begin application only after the structure is completely weathertight.
- B. Apply wallboard with the separated boards in moderate contact but not forced into place.
- C. Conceal the cut edges of the boards at internal and external corners by overlapping the covered edges of the abutting boards.
- D. Stagger the boards so that the corners of any four boards will not meet at a common point except in vertical corners.
- E. Finish perimeters of ceilings where wallboard abuts dissimilar wall materials using an edge bead trim strip applied to wall and accurately aligned with the finished ceiling.
- F. Lay wallboard edges adjoining walls on the horizontal leg of the trim strip.
- G. Apply wallboard to the ceilings with the long dimension of the wallboard at right angles to the furring members.
- H. Wallboard may be applied with the long dimension parallel to furring members that are spaced 16 inches on centers when attachment members are provided at end joints.
- I. Make end joints where necessary over furring or framing members.

- J. The panels shall be of the length required to reach from the ceiling line to the floor line in one continuous length when applied over horizontal furring.
- K. Where specific UL tested assemblies are called out for fire rated assemblies the gypsum board shall be installed as described in the UL test.

3.04 ATTACHMENT

A. General

1. Except as specified herein, fastening shall conform to GA 216.
2. If the paper surface is cracked in fastening, another screw shall be driven approximately 2 inches from the faulty screw. Screw attachment shall proceed from central portion of wallboard toward ends and edges.

- B. Screw method shall be used for wallboard attachment to steel furring and to steel framing. Screws shall be driven with clutch-controlled power screwdrivers and spaced 12 inches on centers on ceilings and 16 inches on centers on walls.

C. Double fastening method

1. Use only for 2 hour fire rated application.
2. Begin fastening on walls at top center and proceed alternately in rows outward to end or edges.
3. Complete attachment to each support member before proceeding to next support member.
4. Make end joints over supporting members.

3.05 JOINT AND FASTENER CONCEALMENT

- A. Areas to be treated shall be inspected to ascertain that wallboard fits tightly against supporting framework. These areas shall be heated to not less than 55 degrees F for 24 hours prior to commencing treatment.
- B. Embedding compound shall be applied to wallboard joints and fastener heads in a thin uniform layer.
 1. Compound shall be spread not less than three inches wide at joints and reinforcing tape shall be centered on the joint and embedded in the compound.

2. A thin layer of compound shall then be spread over the tape.
3. After this treatment has dried, a second coat of embedding compound shall be applied to wallboard joints and fastener heads.
4. Compound shall be spread in a thin uniform coat and to not less than 6 inches wide at joints.
5. Treated areas shall be sanded to eliminate ridges and high points.

C. Finishing compound

1. After embedding compound has dried, a coat of finishing compound shall be applied to joints and fastener heads.
2. Finishing compound applied at joints shall be feathered out to not less than 12 inches wide.
3. After compound has dried, the treated areas shall be sanded as necessary to obtain uniformly smooth surfaces.
4. Care shall be taken not to scuff the paper surface of the wall board.

D. Wall finish:

1. Provide a spray-applied, orange-peel textured, medium finish using an unaggregated texture compound.
2. Refer to PDCA MAN.

3.06 CORNER TREATMENT

- A. Internal corners shall be treated as specified for joints. The reinforcing tape shall be folded lengthwise at the middle and fitted neatly into the corner.
- B. External corners shall have a corner bead fitted neatly over the corner and secured with the same type fasteners used for applying wallboard.
 1. The fasteners shall be spaced approximately 6 inches on centers and driven through the wallboard into the framing members.

2. After the corner piece has been secured in place, the corner shall be treated with joint compound as specified for joints.
3. The joint compound shall be feathered out from 8 to 10 inches on each side of corner.

3.07 SCHEDULE

- A. See Finish Schedule and details in the Drawings for types of gypsum wallboard application, partition types, heights, and special conditions.

END OF SECTION

DIVISION 9

FINISHES

SECTION: 09310

TITLE: CERAMIC TILE

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SECTION 09310

CERAMIC TILE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Ceramic tile floor and base finish
- B. Ceramic tile wall finish

1.02 RELATED WORK

- A. Section 03001 - Plan and Reinforced Concrete
- B. Section 07900 - Caulking and Joint Sealants
- C. Section 09260 - Gypsum Board Systems

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM C847 Metal Lath
- B. Tile Council of America (TCA):
 - TCA HDBK Handbook for Ceramic Tile Installation
 - TCA A108.4 Installation of Ceramic Tile with Water Resistant Organic Adhesive
 - TCA A118.3 Chemical Resistant, Water Cleanable, Tile Setting and Grouting Epoxy
 - TCA A137.1 Specifications for Ceramic Tile

1.04 SUBMITTALS

- A. Submit shop drawings indicating tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
- B. Submit product data indicating material specifications, characteristics, and instructions for using adhesives and grouts.
- C. Submit samples and manufacturer's installation instructions. See Section 01300.

- D. Samples shall be of sufficient size to show color range, pattern, and tile type as applicable.
- E. Submit manufacturer's certification that installed materials meet the requirements of this Specification. See Section 01400.
- F. Submit maintenance data. See Section 01700.
- G. Include recommended cleaning and stain removal methods and cleaning materials.

1.05 QUALITY ASSURANCE

- A. Conform to TCA A137.1 and TCA A108.4.
- B. Manufacturer: company specializing in the manufacture of ceramic tile with a minimum of three years' experience in work of this type.
- C. Installer: company specializing in installing ceramic tile with a minimum of three years' experience in work of this type.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. See Section 01600.
- B. Store and protect products. See Section 01600.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in a closed unventilated environment.
- B. Maintain a minimum temperature of 50 degrees F during and for 24 hours after installation of mortar materials.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Tile:
 - 1. American Olean
 - 2. Dal-Tile
 - 3. Monarch

B. Adhesive:

1. American Olean
2. Bonsal
3. Hydroment

C. Mortar and grout:

1. American Olean
2. Bonsal
3. Hydroment

- D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

A. Tile:

1. Ceramic floor and wall tile: TCA A137.1 conforming to the following:
 - a. Size: 4 1/4 inches x 4 1/4 inches x 5/16 inches or otherwise selected in Finish Schedule.
 - b. Edge: cushioned.
 - c. Surface finish: unglazed or matte glazed as selected in Finish Schedule.
 - d. Color: as selected by DOE/COR from manufacturers standard colors.
2. Base: match floor tile for moisture absorption, surface finish, and color; tile length 4 1/2 or 6 inches long x 4 1/4 inches high; and straight top edge.

- B. Adhesive: epoxy, conforming to TCA A118.3; thinset bond type.

- C. Mortar: conforming to TCA A118.3.

D. Grout:

1. Epoxy resin and hardener: chemical resistant.
2. Color: admixture selected from cured samples.

2.03 ACCESSORIES

- A. Metal lath shall be flat expanded type lath conforming to ASTM C847 and weighing not less than 3.4 pounds per square yard.

2.04 MORTAR MIX AND GROUT MIX

- A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions, TCA A118.3, and TCA HDBK.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that surfaces are ready to receive ceramic tile.
- B. Beginning of installation means Contractor and Installer accept existing surfaces and substrate.

3.02 PREPARATION

- A. Protect surrounding work from damage or disfiguration.
- B. Vacuum existing surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION

- A. Install adhesive, tile, and grout in accordance with manufacturer's instructions and TCA HDBK.
- B. Lay tile to pattern indicated on shop drawings. Do not interrupt tile pattern through openings.
- C. Wall applications:
 - 1. Install backing board over metal studs in accordance with manufacturer's instructions.
 - 2. Tape joints and corners; cover with skim coat or dry set mortar to a feather edge.
- D. Cut tile and fit tight to penetrations.
 - 1. Form corners and bases neatly.
 - 2. Align floor, base, and wall joints.

- E. Stops, trimmers, returns, caps, and special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases or coves shall be solidly backed with mortar.
- F. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size.
 - 1. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
 - 2. Joints shall be sealed. See Section 07900.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep expansion and control joints free of adhesive or grout. Apply sealant to joints.
- I. Allow tile to set for a minimum of 48 hours prior to grouting.
- J. Grout tile joints.
- K. Apply sealant to junction of tile and dissimilar materials and at junction of dissimilar planes.

3.04 CLEANING

- A. Clean work. See Section 01700.
- B. Clean tile surfaces.

3.05 PROTECTION

- A. Protect finished installation. See Section 01500.
- B. Do not permit traffic over finished floor surface for 24 hours after installation.

3.06 SCHEDULE

- A. Material selections and material colors shall be selected by the DOE/COR from manufacturers standard colors.

END OF SECTION

DIVISION 9

FINISHES

SECTION: 09511

TITLE: SUSPENDED CEILING SYSTEM

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SECTION 09511

SUSPENDED CEILING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Suspended metal grid ceiling system
- B. Acoustical tile and panels
- C. Fire-rated assemblies

1.02 RELATED WORK

- A. Section 01300 - Submittals
- B. Section 09111 - Metal Stud Framing, Furring, and Lathing Systems
- C. Section 09260 - Gypsum Board Systems
- D. Section 15300 - Fire Sprinkler Systems
- E. Section 15936 - Air Outlets and Inlets
- F. Section 16500 - Lighting Fixtures

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

- | | |
|-----------|--|
| ASTM C635 | Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings |
| ASTM C636 | Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels |
| ASTM E84 | Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E119 | Fire Tests of Building Construction and Material |

B. Federal Specification (FS):

- | | |
|-------------|--|
| FS HH-I-521 | Insulation Blankets, Thermal Mineral Fiber, for Ambient Temperatures |
|-------------|--|

C. Underwriters Laboratories Inc. (UL):

UL System Ratings

1.04 SUBMITTALS

- A. Submit shop drawings, product data, samples, and manufacturers' installation instructions. See Section 01300.
- B. Indicate on shop drawings grid layout and related dimensioning, junctions with other work or ceiling finishes, and interrelation of mechanical and electrical items related to system.
- C. Submit test reports by an independent testing laboratory. Data attesting to conformance of the proposed system to UL requirements for the fire-endurance rating listed in UL Fire Resistance Directory may be submitted for approval instead of test reports.
- D. Submit two samples illustrating material color and finish of acoustic units.
- E. Submit two 12 inch long samples showing finish and color of the suspension system main runner. Submit the same type and number of samples for the edge trim.

1.05 QUALITY ASSURANCE

- A. Manufacturer: company specializing in manufacture of ceiling suspension systems and ceiling panels with a minimum of three years' experience in work of this type.
- B. Installer: company with a minimum of three years' experience in work of this type and approved by manufacturer.

1.06 SYSTEM DESCRIPTION

- A. Material shall be tested according to ASTM E84.
 - 1. Tests shall have been performed by an approved nationally recognized testing laboratory.
 - 2. Material shall have a flame spread rating not greater than 25 and fuel contributed and smoke developed ratings not greater than 50.
- B. Suspension systems, adhesives and other materials used in the work shall be the standard products of recognized manufacturers and as shown on the drawings. All adhesives shall be UL listed and applied at the UL listed application rate.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved by the Department of Energy Contracting Officers Representative (DOE/COR).

1.08 SEQUENCING AND SCHEDULING

- A. Schedule installation of acoustic units after interior wet work is dry.

1.09 EXTRA STOCK

- A. Provide extra quantity of acoustic units. See Section 01700.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Suspension system:

- 1. Donn
- 2. Chicago Metallic
- 3. Armstrong

- B. Acoustic units:

- 1. Armstrong: Fire Guard
- 2. Conwed: Natural Fissured II
- 3. United States Gypsum Company (USG): Firecode

- C. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the DOE/COR. See Section 01600.

2.02 MATERIALS

- A. Suspension systems:

- 1. Grid: ASTM C635, intermediate duty, fire rated exposed T; components die cut and interlocking, exposed surfaces prefinished.
- 2. Accessories: stabilizer bars, clips, splices, edge moldings, hold down clips, and other accessories required for suspended grid system.

3. Grid materials: commercial quality cold rolled steel with galvanized coating.
 4. Grid finish: color as selected by the DOE/COR from manufacturers standard colors.
 5. Support channels and hangers: galvanized steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.
- B. Acoustic units:
1. Acoustic tiles conforming to the following:
 - a. Size: 12 inch by 12 inch
 - b. Thickness: 3/4 inch
 - c. Composition: mineral
 - d. Light reflectance: 75%
 - e. NRC range: .55 to .65
 - f. STC range: 35 to 39
 - g. Fire hazard classification: 25/50/50
 - h. Joint: kerfed
 - i. Edge: beveled
 - j. Surface color: white unless otherwise indicated on Finish Schedule
 - k. Surface finish: non-directional fissured
 2. Acoustic panels conforming to the following:
 - a. Size: 24 inch by 48 inch.
 - b. Thickness: 5/8 inch
 - c. Composition: mineral
 - d. Light reflectance: 75%
 - e. NRC range: .55 to .65
 - f. STC range: 35 to 39

- g. Fire hazard classification: 25/50/50
- h. Edge: square
- i. Surface color: white unless otherwise indicated on Finish Schedule
- j. Surface finish: non-directional fissured

2.03 ACCESSORIES

- A. Acoustic batt insulation: FS HH-I-521, friction fit, unfaced; 3 inches thick
- B. Gypsum board: As indicated on the Drawings and detailed in Section 09260.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that existing conditions are ready to receive work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Beginning of installation means Contractor and Installer accept existing conditions.

3.02 INSTALLATION

- A. Install system in accordance with ASTM C636 and as supplemented in this section.
- B. Install fire rated system in accordance with UL approved assemblies. Fire resistive rating shall be in accordance with ASTM E119.
- C. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- D. Install after major work above ceiling is complete. Coordinate the location of hangers with other work.
- E. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

- G. Center system on room axis leaving equal border units or according to reflected ceiling plan.
- H. Do not support components on main runners or cross runners if weight causes total dead load deflection to exceed $1/360$ of the span. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- I. Do not eccentrically load system or produce rotation of runners.
- J. Install edge molding at intersections of ceilings and vertical surfaces using longest practical lengths.
 - 1. Miter corners.
 - 2. Provide edge moldings at junctions with other interruptions.
 - 3. Where round obstructions occur, provide preformed closers to match edge molding.
- K. Form expansion joints as detailed.
 - 1. Form to accommodate movement plus or minus one inch.
 - 2. Maintain visual closure.
- L. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- M. Lay directional patterned units according to reflected ceiling plan.
- N. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.
- O. Lay acoustic insulation for a distance of 48 inches either side of acoustic partitions indicated on the Drawings.
- P. For fire rated ceiling assemblies, install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

3.03 TOLERANCES

- A. Variation from flat and level surface: $1/8$ inch maximum in 10 feet
- B. Variation from plumb of grid members caused by eccentric loads: 2 degrees maximum

3.04 SCHEDULE

- A. Material locations, material colors, and special conditions are indicated on the Finish Schedule of the Drawings.

END OF SECTION

DIVISION 9

FINISHES

SECTION: 09650

TITLE: RESILIENT FLOORING

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SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Tile flooring
- B. Base
- C. Stair nosings, treads, and risers

1.02 RELATED WORK

- A. Section 03001 - Plain and Reinforced Concrete
- B. Section 09260 - Gypsum Wallboard Systems
- C. Section 10270 - Access Flooring

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM E84 Surface Burning Characteristics of Building Materials
- B. Federal Specifications (FS):
 - FS RR-T-650 Treads, Metallic and Non-metallic, Non-skid
 - FS SS-T-312 Tile, Floor: Asphalt, Rubber, Vinyl, Vinyl Composition
 - FS SS-W-40 Wall Base: Rubber and Vinyl Plastic

1.04 SUBMITTALS

- A. Submit shop drawings and product data. See Section 01300.
- B. Provide seaming plan.
- C. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns, and colors available.

- D. Submit samples. See Section 01300.
- E. Submit two samples for each floor material specified, illustrating color and pattern.
- F. Submit 2 inch long samples of base and stair material for each color specified.
- G. Submit manufacturers' installation instructions. See Section 01300.

1.05 QUALITY ASSURANCE

- A. Manufacturer: company specializing in manufacture of resilient flooring with a minimum of three years' experience in work of this type.
- B. Installer: company with a minimum of three years' experience in work of this type and approved by manufacturer.

1.06 REGULATORY REQUIREMENTS

- A. Material shall be tested according to ASTM E84.
 - 1. Tests shall have been performed by an approved nationally recognized testing laboratory.
 - 2. Material shall have a flame spread rating not greater than 25 and fuel contributed and smoke developed ratings not greater than 50.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit cleaning and maintenance data. See Section 01700.
- B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. For three days prior to installation, store materials in area of installation to achieve temperature stability.

- B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

1.09 EXTRA MATERIALS

- A. Spare tiles of each color and pattern shall be furnished at the rate of 25 tiles for each 1,000 tiles installed.
 - 1. Tiles shall be from the same lot as installed and delivered to the Department of Energy Contracting Officers Representative (DOE/COR) in unopened cartons.
 - 2. Cartons to be labeled with project name and contract number.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Tile flooring:
 - 1. Armstrong
 - 2. Kentile
 - 3. Azrock
- B. Stair covering:
 - 1. R.C. Musson Rubber Co.
 - 2. Roppe
 - 3. Johnsonite
- C. Base materials:
 - 1. Roppe
 - 2. Burke Flooring Products
 - 3. Johnsonite
- D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the DOE/COR. See Section 01600.

2.02 MATERIALS

A. Tile flooring:

1. Vinyl-composition tile: FS SS-T-312, Type IV, Composition 1, 12 inch by 12 inch by 1/8 inch thick, plain or marbled design as selected in Finish Schedule.
2. Vinyl tile: FS SS-T-312, Type III, 12 inch by 12 inch by 1/8 inch thick, plain or marbled design.

B. Stair covering:

1. Treads: FS RR-T-650, Type B, Class 2, rubber, 3/16 inch thick, full width and depth of stair tread in one piece, raised pattern design, return down edge of tread 1 7/8 inch with tapered thickness.
2. Risers: sheet rubber, 1/8 inch thick, maintain height and length in one piece.
3. Nosing: rubber, 3/16 inch thick, 2 3/4 inch horizontal return 1 3/4 inch return down edge of tread, full width of stair tread in one piece, raised pattern design.
4. Skirting: sheet rubber, .80 inch thick, maintain width sufficient to provide 2 inches above stair nose, measured perpendicular to stair slope.

C. Base materials:

1. General: FS SS-W-40, Type I rubber or Type 2 vinyl, 4 inch high, 1/8 inch thick, top set, coved, premolded, external corners.
2. Accessories: premolded end stops and external corners, of same material, size, and color as base.

2.03 ACCESSORIES

- A. Subfloor filler: white premix latex, type recommended by flooring material manufacturer.
- B. Primers and adhesives: waterproof, types recommended by flooring manufacturer.
- C. Edge strips: flooring material.
- D. Sealer and wax: types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 SCHEDULING

- A. Resilient flooring shall be scheduled after all other work which would damage the finished surface of the flooring.

3.02 SURFACE CONDITIONS

- A. Flooring shall be installed only on surfaces that are suitable and would permit a proper installation.
1. Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and unevenness shall have been corrected. All damaged portions of concrete slabs shall have been repaired as recommended by the flooring manufacturer.
 2. Concrete curing compounds, other than the types that permit adequate adhesion, shall be entirely removed from the slabs.
 3. Beginning of installation means Contractor and Installer accept existing substrate and site conditions.

3.03 MOISTURE TEST

- A. After concrete floor surfaces have been cleaned, small patches of adhesive to be used shall be spread in several locations in each room and allowed to dry overnight.
1. If the adhesive can be peeled easily from the floor surfaces, the floor is not sufficiently dry.
 2. The test shall be repeated until the adhesive adheres properly.
 3. When the adhesive adheres tightly to the floor surface, the resilient flooring shall be applied.
 4. If concrete floors are in contact with the ground or over unventilated crawl spaces, small patches of primer shall be used lieu of adhesive to test for moisture.

3.04 INSTALLATION

A. Tile flooring:

1. Tile flooring and wall base shall be installed in accordance with the instructions of the manufacturer.
 - a. Tile lines and joints shall be kept square, symmetrical, tight, and even. Each floor shall be in a true level plane, except where indicated as sloped.
 - b. Edge width shall vary as necessary to maintain full size tiles in the field, but no edge tile shall be less than one-half the field tile, except where irregular shaped rooms make it impossible.
 - c. Flooring shall be cut to and fitted around all permanent fixtures, built-in furniture, and cabinets, pipes, and outlets.
 - d. Edges shall be cut, fitted, and scribed to walls and partitions after field flooring terminates at points higher than the contiguous finished flooring, except at doorways where thresholds are provided.
 - e. Plastic strips shall be secured with adhesive.

B. Stair covering materials:

1. Install nosing, treads, and risers: one piece for full width and depth of tread.

2. Install skirting tightly to stair and stringer profile.
3. Apply adhesive over entire surface. Fit accurately and securely.

C. Base material:

1. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
2. Miter internal corners and use premolded units at external corners and exposed ends.
3. Install on solid backing. Bond tight to wall and floor surfaces.
4. Scribe and fit to door frames and other interruptions.

3.05 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax floor and base surfaces in accordance with manufacturers' instructions.

3.07 FINISH SCHEDULE

- A. Material locations, material colors, and special conditions are indicated on the Finish Schedule of the Drawings.

END OF SECTION

DIVISION 9

FINISHES

SECTION: 09686

TITLE: CARPETING

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SECTION 09686

CARPETING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Carpeting

1.02 RELATED WORK

A. Section 01300 - Submittals

B. Section 03001 - Plain and Reinforced Concrete

C. Section 06001 - Carpentry Work

D. Section 07900 - Caulking and Joint Sealants

E. Section 08100 - Metal Doors and Frames

F. Section 08700 - Builder's Hardware

G. Section 09260 - Gypsum Board Systems

H. Section 09650 - Resilient Flooring

I. Section 09900 - Painting

1.03 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC):

AATCC COLR Color Transference Chart

AATCC 9 Colorfastness to Crocking: Crockmeter Method (Wet and Dry Crock

AATCC 16E Colorfastness to Light: Watercooled Xenon-Arc Lamp Continuous Light

AATCC 134 Electrostatic Propensity of Carpet

B. American Society for Testing and Materials (ASTM):

ASTM D1335 Tuft Bind of Pile Floor Coverings

ASTM D2257 Extractable Matter in Yarns

- ASTM E84 Surface Burning Characteristics of
 Building Materials
- ASTM E648 Critical Radiant Flux of Floor Covering
 Systems Using a Radiant Heat Energy
 Source

C. Federal Specifications (FS)

- FS DDD-C-95 Carpets and Rugs, Wool, Nylon, Acrylic,
 Modacrylic
- FS DDD-C-1559 Carpet, Loop, Low Pile Height, High
 Density, Woven or Tufted with Attached
 Cushioning

D. National Fire Protection Association (NFPA)

- NFPA 101 Life Safety Code
- NFPA 253 Critical Radiant Flux of Floor Covering
 Systems Using a Radiant Heat Energy
 Source

E. Underwriters Laboratories Inc. (UL)

1.04 SUBMITTALS

- A. Submit shop drawings, product data, samples, and
manufacturer's installation instructions. See Section
01300.
- B. Indicate seaming plan, method of joining seams, and
direction of carpet.
- C. Provide product data on specified products, describing
physical and performance characteristics, sizes,
patterns, and colors available, and method of
installation.
- D. Provide certified copies of test reports demonstrating
conformance with NFPA 101, Class I when tested in
accordance with ASTM E648 (NFPA 253) and stating that
the carpet supplied is identical to carpet tested.
- E. Submit four 12 inch by 12 inch samples illustrating
color and pattern for carpet specified.
- F. Submit four 9 inch long samples of edge strip and base
gripper material for each color specified.

1.05 QUALITY ASSURANCE

- A. Manufacturer: company specializing in woven and tufted carpet with a minimum of five years' experience in work of this type.
- B. Installer: company with a minimum of five years' experience in work of this type and approved by manufacturer.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data. See Section 01700.
- B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for carpet flammability requirements in accordance with ASTM E84.
- B. Conform to ASTM E648.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. For one day prior to installation, store materials in area of installation to achieve temperature stability.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Mohawk
- B. Bigelow
- C. Burlington Industries: Lee Commercial Carpet
- D. Substitutions: Alternate products, equal in quality and utility to those specified, may be used subject to the approval of the Department of Energy Contracting Officers Representative (DOE/COR). See Section 01600.

2.02 MATERIALS

- A. Materials shall conform to FS DDD-C-1559 and the other requirements specified.

B. Physical requirements:

1. Carpet shall be tufted or woven construction, first quality, free of visual blemishes, streaks, poorly dyed areas, and other defects.
- * 2. Carpet materials and treatments shall be non-toxic when used as ordinarily intended, reasonably non-allergenic, and free of other recognized health hazards.
3. Carpet shall conform to the following:
 - a. Pile fiber: tufted or woven with a plush cut or level loop pile, and 20% nylon yarn.
 - b. Pile weight: 30 ounce per square yard minimum.
 - c. Width: 12 feet minimum.
 - d. Patterns and colors: As selected by the COR from manufacturers standard patterns and colors, Mohawk, Supertron; SUP-1, "Painted Desert" shall be used for as a basis for approval.

C. General:

1. Fibers for yarn shall not have been reclaimed from any woven, tufted, knitted, or felted products.
2. There shall be no undrawn fiber in spun yarn.
3. Spun yarn shall be at least two ply and shall have sufficient twist to develop adequate yarn characteristics to ensure high wearability and to minimize pilling and fuzzing of the finished carpet.
4. Plied yarns shall have a twist in the opposite direction to the singles.
5. Yarn setting shall be sufficient to ensure permanent texture retention under normal use conditions, cleaning, and shampooing.
6. Fiber denier and staple length shall be subject to normal tolerances with the following limitations:
 - a. Acceptable tolerance in staple length not more than 10%.
 - b. Acceptable denier variance plus or minus 10% in individual filament denier and plus or minus 3% in average denier.

- D. Continuous filament nylon: not less than second generation, continuous high bulk or textured carpet type fiber modified to provide increased translucence or capacity for soil hiding with average filament size of 15 denier or coarser.
- E. Extractable matter in finished yarn:
1. ASTM D2257; not more than 2%, extracted using single solvent as follows:
 - a. Nylon: halogenated hydrocarbon or cyclohexane.
 - b. Backing material:

Primary backing: 3.5 ounce per square yard minimum polypropylene.

Secondary backing: 6 ounces per square yard minimum stainless jute or 3 1/2 ounce per square yard minimum polypropylene.
- F. Performance requirements:
1. Shrinkage: FS DDD-C-95, except, maximum shrinkage of length and width shall be 3%.
 2. Colorfastness of light:
 - a. AATCC 16E, use the Xenon arc as the light source.
 - b. Consider colors that are deeper or equivalent in hue to Row 2 of the AATCC Color Transference Chart as dark colors; consider those lighter as light colors.
 - c. Colors for synthetic yarns shall show a gray scale rating of at least 4 for light shades after the equivalent of at least three L-4 breaks.
 - d. Base classification on the AATCC Blue Wool Lightfastness Standards L-2 to L-9.
 - e. Test all colors specified.
 - f. If the Xenon Arc Fadeometer has a built-in continuous monitor and control device made by the manufacturer, blue wool standards referenced in AATCC 16E need not be used to judge the L-4 breaks, if manufacturer's instructions are followed.

3. Dry and wet crocking: AATCC 9, all colors specified shall show a minimum rating of Step 4 on the AATCC Color Transference Chart.
4. Pile coverage: sufficient to conceal dye-matched backing and as specified.
5. Tuft bind: ASTM D1335; the minimum tuft bind in average pounds force for loop pile shall be 12 pounds.
6. Flammability: the carpet shall have a Class B rating (NFPA 101) or shall have a critical radiant flux greater than 0.5 watts per square centimeter when tested using NFPA 253 test method.
7. Static control: AATCC 134: incorporate a permanent static control system to control static build up to less than 3.5 kV. Test at 8% relative humidity at 75 degrees F.

2.03 MOLDING

- A. Heavy-duty vinyl designed for the type of carpet being installed or as shown on drawings.
- B. Floor flange shall be a minimum of 4 inches wide.
- C. Color shall be standard manufacturer's color to match carpet.

2.04 ADHESIVES

- A. Waterproof, nonflammable, carpet (latex release) adhesive system as furnished or recommended by the carpet manufacturer and designed to facilitate easy removal of carpet at a later date
- B. Seam adhesive shall be waterproof, nonflammable, and nonstaining as furnished or recommended by the carpet manufacturer.

2.05 WARRANTY

- A. Provide a five year warranty, jointly with the manufacturer, against defects in materials and workmanship.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that substrate surfaces are smooth and flat with maximum variation of 1/4 inch in 10 feet and are ready to receive work.
- B. Beginning of installation means Contractor and Installer accept existing substrate and site conditions.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to leave smooth, flat, hard surface.
- C. Prohibit traffic until filler is cured.
- D. Vacuum floor surfaces.
- E. Remove any grease, oil, and other deleterious material which would stain the carpet after installation.

3.03 INSTALLATION

A. Carpet:

- 1. Install in accordance with manufacturer's instructions.
- 2. Lay out rolls of carpet for approval.
- 3. Verify carpet match before cutting to ensure minimal variation between dye lots.
- 4. Double cut carpet to allow intended seam and pattern match. Make cuts straight, true and unfrayed.
- 5. Locate seams in areas of least traffic.
- 6. Join seams using hot adhesive tape. Form seams straight, not overlapped or peaked, and free of gaps.
- 7. Lay carpet on floors with run of pile in same direction as anticipated traffic.

8. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color pattern between rooms under door centerline.
9. Cut and fit carpet around interruptions.
10. Where wall bases are scheduled, cut carpet 1/4 inch from walls to allow re-stretching. Fit carpet tight to vertical interruptions, leaving no gaps.
11. Lay carpet tight and flat on sub-floor, well fastened at edges, with a uniform appearance. Provide monolithic color, pattern, and texture match within any one area.
12. Install one piece gripper edging strip where carpet terminates at other floor coverings and to vertical floor surfaces. Where splicing cannot be avoided, seam ends tight and flush.

3.04 CLEANING

- A. Remove excess adhesive from floors, bases, and walls without damaging the surfaces.
- B. Clean and vacuum carpet surfaces.

3.05 PROTECTION

- A. Prohibit traffic from carpet areas for 24 hours after installation.

3.06 EXTRA MATERIAL

- A. Deliver to DOE/COR any usable scraps and overages, properly packaged and labeled.
- B. Furnish DOE/COR with a minimum of 10 square yards of each type, pattern, and color for maintenance purposes.

END OF SECTION