SECTION 02821

REVEGETATION - SEEDING, SODDING, HYDROSEEDING

1.00 GENERAL

1.01 Scope

A. Furnish labor, materials, equipment and services to complete the following work which shall include but not necessarily be limited to:

1. Soil Preparation and Scarification;
2. Topsoil Placement;
3. Seeding, hydro-seeding or sodding;
4. Fertilizing;
5. Mulching;
6. Installing erosion blanket;
7. Maintaining areas.

1.02 Related Work Specified Elsewhere.

Section 02200 - Excavation and Embankment
Section 02201 - Excavation and Backfill For Structures

1.03 Submittals:

A. Seed mixture certifications stating botanical & common name, percentage by weight, and percentage of purity, germination, and weed seed of each grass species.
B. Certification for mulch as "weed free".
C. Certificates of compliance for fertilizer and tacifier.

2.0 MATERIALS

2.01 Seed Mix. Seed shall be at least 95% pure and shall have a minimum germination percentage of 85%. Seed shall be furnished separately or in mixtures in standard containers with the same seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: Name and address of laboratory, date of test, lot number of each kind of seed, and the results of tests as to name, percentage of weed content for each kind of seed furnished, and in case of a mixture, the proportions of each kind of seed.

A. Recommended Dryland Seed Mix (below 9000 feet)	% of Total/ 1000 sf
Western Wheat Grass (50% split or as available)	50.00 %
Slender Wheat Grass (50% split or as available)	50.00 %
Green Needle Grass	6.25 %
Candy or Upland Bluegrass	3.25 %
Hard Fiscue	9.50 %
Creeping Red Fescue	9.50 %
Kentucky Bluegrass "Troy"	9.00 %
Lupine (Wildflower substitutes are acceptable)	12.50 %
Globe Mallow	
Scarlet Gilia	
Flax	
Aspen Daisy	

B. Recommended Seed Mixture (9,000-10,500 feet)	
Lincoln Smooth Brome	25.00 %
Orchard Grass (Pot Omac)	20.00 %
Nord Crest Wheat	20.00 %
Slender Wheat Grass	20.00 %
Russian Wild Rye	15.00 %

C. Recommended Seed Mixture (10,500 feet and above)	
Kentucky Blue Grass	25.00 %
Timothy	25.00 %
Chewing Fiscue	10.00 %
Pennlawn Red Fescue	10.00 %
Meadow Foxtail	10.00 %
Manchar Smooth Brome	10.00 %
Alsike Clover	10.00 %

Note: As an addition to the basic above, add oats, barley or winter wheat as a seasonal cover crop.

2.02 Fertilizer. Fertilize all seeded areas with a commercial type 15-40-5 mixture of similar ratio. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate specified in these Specifications and shall meet the specified requirements of the applicable Federal and State laws. They shall be furnished in standard containers with name, weight and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

2.03 Topsoil. Material stripped from site consisting of loose friable loam reasonably free of admixtures of subsoil, refuse, stumps, rocks, brush, weeds or other material detrimental to proper development of vegetative growth. Topsoil shall be a minimum depth of four inches (4").

2.04 Straw Mulch. Mulch all seeded and hydro-seeded areas with straw mulch. Material for straw mulching shall consist of straw or oats, barley, wheat or rye and shall be certified as weed free. A copy of the certification shall be submitted to the Engineer prior to placement of any materials. Clean field hay may be substituted for straw when approved by the Engineer. Straw or hay in such an advanced stage of decomposition as to smother or retard the normal growth of grass will not be accepted.

2.05 Tacifier. Straw mulch shall be secured by TerraTack or approved equal.

2.06 Erosion Blanket. Erosion Blanket shall be as specified on Drawings. The blanket shall be smolder resistant, not toxic to vegetation or germination of seed and shall not be toxic or injurious to humans.

3.00 EXECUTION

3.01 Time of Year to Seed and Hydro-seed.

Spring Seeding	Fall Seeding
Spring Thaw to July 1st	Oct 15th until consistent ground freeze

A. "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried 1/2 inch into the surface soil (topsoil) through normal drill seeding methods.

B. "Consistent ground freeze" shall be defined as that time during the fall months in which the surface soil (topsoil) due to freeze conditions, prevents burying the seed 1/2 inch through normal drill seeding operations. At no time shall seed be sown, drilled or otherwise planted when the surface soil or topsoil is in a frozen or crusted state.

C. Seeding at any time other than within the above seasons shall be allowed only when the Contractor submits a written request for permission to do so and permission is granted. In the request, the Contractor must agree to apply the specified seed at a rate of not less than 25 percent greater per unit area than the rates specified for use within the seeding season. The additional materials shall be furnished and placed at the Contractor's expense. The Contractor must also agree to reseed, re-mulch and repair any areas seeded out-of-season which fail to wind, erosion, lack of germination and/or disturbance by the Contractor.

D. Where out-of-season seeding is ordered, the cost of additional material if required will be paid for, and in this event, the Contractor will not be held responsible for damage or failure beyond his control due to out-of-season seeding.

3.02 Topsoil Excavation. Remove all sod, topsoil, organic earth, stockpile topsoil as designated on Drawings or as directed by Engineer.

3.03 Topsoil Placement.

A. General: When job site has been shaped and ready for placement of topsoil, cover all cut-fill areas and construction scars with topsoil to depth of 6". Contour all surfaces to approximate grade and blend with existing adjacent terrain in accordance with detail drawings.

B. Slope Rounding: Round top and bottom of slopes and feather into undisturbed natural terrain. Avoid abrupt grade changes, making smooth transitions from slopes to more level areas.

C. Slope Molding: Avoid long continuous slope faces by molding face of slope to accent existing adjacent terrain. Steepened slope faces near ridges and bluffs, laid back to link to natural draws, creating an undulating face.

D. Surface Roughing: Gouge slope surfaces of 2:1 or steeper with horizontal ridges and trenches to depth of 6" minimum, creating roughened surface to lessen erosion, improve moisture percolation and soil layer binding. Trenches or ridges shall not be longer than 30' to prevent water accumulation and flowing water to cause rivulets.

3.04 Preparation for Planting of Lawns.

A. Grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll and rake and remove ridges and fill depressions as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

B. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do no create a muddy soil condition.

C. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

D. Preparation of Unchanged Grades. Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows:

Till to a depth of not less than six inches, apply soil amendments and initial fertilizers as specified; remove high areas and fill depressions; till soils to a homogeneous mixture of fine texture free of lumps, cods, stones, roots and other extraneous matter.

3.05 Fertilizing. Apply fertilizer at the rate of 100 lbs. per acre.

3.06 Seeding and Sodding.

A. Hydro-seeding.

1. Seed and fertilizer shall be applied by spraying them on slopes of 3:1 or greater gradient in the form of an aqueous mixture and by using the methods and equipment described herein.

2. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping al the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 pounds per square inch. The pump shall be mounted in a line which will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipelines shall be capable of providing clearance for 5/8" solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supported stand in such a manner that it can be rotated through 360° horizontally and inclined vertically from at least 20° below to at least 60° above the horizontal.

There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over a distance varying from 20 feet to 100 feet. One shall be a close-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

3. Mixtures. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life.

Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least 2 weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source which is determined to be unsuitable by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within 2 hours from the time they were mixed or they shall be wasted and disposed of at locations acceptable to the Engineer.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds. The mixture shall be applied by means of a high-pressure spray which shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with Specifications shall be used to cover specified sections of known area. Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

Seeding shall be at 1.5 lbs. per 1000 sq. ft. or 65 lbs. per acre.

B. Dryland Seeding.

1. Do not use wet seed or seed which is moldy or otherwise is damaged in transit or storage.

2. Sow seed using a spreader, seeding machine or drill seeder. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.

3. Sow not less than 1.5 lbs. per 1000 sq. ft.

4. Rake seed lightly into top 1/8" of soil, roll lightly, and water with a fine spray.

C. Sodding New Lawns.

1. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen.

2. Lay sod to form a solid mass of with tightly-fitted joints. Butt ends and

sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering or adjacent grass.

3. Secure sod on slopes with wood pegs to prevent slippage. Water sod thoroughly with a fine spray immediately after planting.

4. Maintain sodded lawns by watering, fertilizing, weeding, mowing, trimming and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas until project is accepted by the Owner.

3.07 Straw Mulching. All seeded areas shall be mulched, as a separate process, with straw at a rate of 11/12 tons/acre. Straw shall be applied in a uniform manner using standard straw blowing equipment. Areas not accessible, by reach, to straw blowing equipment shall be mulched by hand.

Areas not properly mulched or damaged shall be repaired and re-mulched in an acceptable manner, at Contractor's expense. Mulch removed by circumstances beyond the Contractor's control shall be repaired as ordered.

3.08 Tacifier. Straw mulch not covered by erosion blanket shall be secured by TerraTack tacifier or approved equal. TerraTack shall be applied at a rate of 180 lbs/acre.

3.09 Erosion Blanket. Areas requiring erosion blanket are designated on the Drawings and are generally on slopes of 1%:1 or greater. The blanket must be placed no later than 24 hours after seeding. The material shall be applied smoothly but loosely on the soil surface without stretching. The upslope end of each piece of blanket shall be buried in a narrow trench six inches deep. After the blanket is buried, the trench should be tamped firmly closed.

In cases where one roll of blanket ends and a second roll starts, the upslope piece should be brought over the buried end of the second roll so that there is a twelve (12) inch overlap to form a junction slot.

Overlaps of blanket which run down the slope, outside edges and center, shall be stapled on two foot intervals. Each width of jute mesh shall have a row of staples down the center as well as along the edge. Check slots and junction slots will be stapled across at six inch intervals.

4.00 MEASUREMENT AND PAYMENT

See Bid Schedule

End of Section

SECTION 02822

TEMPORARY EROSION CONTROL

1.00 DESCRIPTION

1.01 This work consists of furnishing and applying a soil binding slurry over disturbed slopes as a temporary soil erosion inhibitor. Disturbed slopes that will not be re-worked and finished slopes that are not scheduled revegetation for a period 21 days or more shall be treated as construction progresses. As construction progresses into the Fall season, all disturbed slopes that will not be re-worked before spring and finished slopes that are not scheduled for revegetation until spring shall be treated before the onset of winter and far enough in advance, in order for the treatment to be applied in accordance of the climatic requirements of this specification. Contractor shall furnish the equipment and labor necessary for performing the work.

1.02 Soil binding agent shall be applied to all disturbed open slopes using standard mechanized hydraulic equipment used for broadcasting water based slurry products.

1.03 The soil-binding agent shall be added to the proportionate quantity of water and thoroughly mixed per manufacturer's recommendations.

1.04 This specification shall apply to all disturbed areas outside COOT right-of-way.

2.00 MATERIALS

2.01 Soil binder shall be Soil Master WR or approved equal. Soil binder shall be non-toxic, non- flammable and conform to the following properties:

Copolymer of methacrylates/acrylates/acrylics/tripolycate	60%
Extgoxylated surfactants	2%
Silicates	2%
Inert ingredients	36%
pH	4 - 5.1
Color	Milky white
Lbs. per U.S. gallon	9 - 10 lbs.

2.02 Wood cellulose fiber mulch shall be Mat-Fiber, or approved equal. Wood cellulose fiber mulch shall conform to the following requirements:

Moisture content (total weight basis)	12.0% +/- 3%
Organic matter (oven-dried weight basis, min.) Inorganic content (oven-dried weight basis, max.) pH at 3% consistency in water slurry (avg.)	99.3%
	0.7%
	4.9
Water holding capacity (min.) Color	1.2 gal.lib.
	Green

2.03 Water used for establishing the proper dilution ratio shall be clean, free of sediment and other debris and pollutants.

3.00 CONSTRUCTION REQUIREMENTS

3.01 Liquifed soil binder (Soil Master WR) shall be thoroughly mixed with water and wood cellulose fiber mulch (Mat-Fiber) into a homogeneous mix and applied to the disturbed ground at the following rate per acre:

Soil Binder/Acre	Cellulose Fiber/Acre	Water/Acre
165 gallons	200 pounds	2,000 gallons

The soil-binding product and cellulose fiber mulch shall be slowly poured into the slurry tank with agitators activated until a homogeneous slurry is formed. The soil binding slurry shall be applied when the ground temperature is fifty degrees F. or greater at time of application and sustained while the slurry solidifies and stabilizes for a forty-eight hour period.

The soil binding slurry shall be sprayed uniformly over the disturbed areas. Application shall be in the form of a mist and avoid over saturation that results in the slurry running off the slope. Contractor may need to spray areas more than once to achieve the proper coverage and avoid over-saturation. The slurry shall be applied to a moistened ground, but not in the presence of freestanding surface water. Any areas not sealed with the soil binder properly or areas damaged due to the negligence of the Contractor shall be repair and retreated.

The Engineer may order test sections be established for adjusting the equipment and assure proper application and conformance to the specification.

End of Section

SECTION 02830
TREES, PLANTS AND GROUND COVER

1.0 GENERAL

1.01 Scope of Work. Work to be performed under this Section shall include all furnishing of plants and related materials, labor and equipment required to complete the installation of the exterior landscape work indicated on the Drawings.

1.02 Related Work Specified Elsewhere.

Section 02200 - Excavation and Embankment
Section 02201 - Excavation and Backfill for Structures
Section 02751 - Raw Water Irrigation Distribution and Underground Sprinkler System

1.03 Quality Assurance.

A. Reference Standards.

Plants shall be first class representatives of the specified species or variety, in healthy conditions with normal well developed branch root systems, free of all objectionable features, and shall conform to the requirements of the *USDA Standard For Nursery Stock,* 1969 Edition, *AAN Standardized Specifications, The American Joint Committee on Horticulture (AJCH)* [plant names should meet the standards of AJCH], *The American National Standard Institute (ANSI)* [nursery stock should meet ANSI Standard Specifications], and *The Colorado State Nursery Act of 1965.* Where standards may conflict, use the standard which requires the highest quality of performance.

B. Inspection and Approval.

Engineer reserves the right to reject, at any time or place prior to acceptance of, any and all materials and plants which, in his opinion, fails to meet specifications. Inspection of plants are primarily for quality, size and variety, but other requirements are not waived even though visual inspection results in approval. Plants may be inspected where growing, but inspection at the place of growth shall not preclude the right of rejection at the site. Rejected plants and other materials shall be promptly removed from the site and replaced with suitable specimens. All trees and shrubs shall be from a point or origin similar in altitude and climate as the construction site.

C. Acceptable Contractor.

Landscape work shall be subcontracted to a single firm specializing in this type of work.

1.04 Source Quality Control.

A. Substitutes.

If specified landscape material is unobtainable, submit to Engineer proof of unavailability and proposals for use of equivalent material. When authorized, adjustment of contract amount will be made.

B. Trees and Shrubs.

1. Provide trees and shrubs grown in a recognized nursery in accordance with good horticulture practice.

2. Provide healthy, vigorous stock free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

3. Sizes. Provide trees and shrubs of sizes shown or specified. Trees and shrubs of larger size may be used if acceptable to Engineer, and if sizes or roots or balls are increased proportionately.

C. Inspection.

Engineer reserves the right to inspect trees and shrubs at site before planting, for compliance with requirements for name, variety, size and quality.

1.05 Submittals.

A. Certificates. All required state, federal or other inspection certificates shall accompany the invoice for plant materials, showing source of origin and shall be filed with the Engineer prior to acceptance of the material.

B. Topsoil. Before delivery of topsoil, furnish Engineer with written statement giving locations of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped and crops growing during past two years.

C. Planting Schedule. Submit planting and seeding schedule to Engineer showing scheduled dates for each type of planting in each area of site.

D. Maintenance Data. At completion of work, furnish three (3) copies of written maintenance instructions to Engineer for maintenance and care of installed individual plant types through their full grange season.

E. Warranty. At completion of work, furnish written warranty to Engineer based upon requirements of Paragraph 1.08.

1.06 Delivery, Storage and Handling.

A. Delivery.

1. Deliver packaged landscape materials to site in original unopened containers bearing manufacturer's information (chemical analysis, name, trade name, trademark and conformance to state law.

2. Provide freshly dug trees and shrubs. Do not prune prior to delivery. Do not bend or bind-tie trees or shrubs in such a manner as to damage bar,

break branches or destroy natural shape. Provide protective covering during delivery.

3. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than six hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist.

4. Do not remove container-grown stock from container until planting time.

5. Each plant shall be identified by means of a grower's label affixed to the plant. The grower's label shall give the data necessary to indicate conformance to specifications. Use durable waterproof labels with water resistant ink which will remain legible for at least 60 days. Notify Engineer prior to delivery of plant materials to the site so that a pre-planting inspection may be made or indicate delivery schedule in advance so plant material may be inspected upon arrival at job site, whichever is more appropriate.

6. Removal unacceptable plant material immediately from job site.

B. Storage.

1. Deliver balled and burlapped stock directly from nursery and heel-in immediately if not being planted within the same day.

2. The Contractor will not be responsible for malicious destruction of plantings after installation. He shall be responsible for replacement of vandalized materials not yet installed. Report all cases of vandalism promptly to the Architect.

C. Handling.

1. Do not drop plants. Do not lift plants by the trunk, stems or foliage. The ball of the plant shall be natural, and the plant shall be handled by the ball at all times. No balled or burlapped plant shall be accepted if the ball is broken or the trunk is loose in the ball.

2. All plants shall be protected at all times from drying out or other injury. Minor broken or damaged roots shall be pruned before planting. Major damage shall be cause for rejections as determined by the Engineer.

1.07 Job Conditions.

A. Existing Conditions.

1. Contractor shall determine location of utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

2. The Contractor shall be responsible for proper repair of the sprinkler system and other underground pipe or electrical wiring damaged by operations under this section. Repairs will be made by contractors designated by the Engineer with cost being charged to this Contractor.

3. If a new tree or shrub is necessary due to interference with utility boxes or pits and undergrounding piping or wiring, the Contractor shall notify the Engineer and receive approval of a new location. The Engineer must approve the precise location of all plants prior to pit excavation and installation.

4. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Engineer before planting.

B. Protection.

The Contractor shall inform the Owner in writing if special tree protection and traffic control must be installed to protect the planting from damage after the Owner assumes responsibility for maintenance.

C. Planting Schedule.

1. Sequencing/Scheduling.

Proceed with the complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

2. Plant and install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

3. Prepare a proposed planting schedule and submit to Engineer. Schedule dates for each type of landscape work during normal seasons for such work in area or site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

1.08 Warranty.

A. Plant Material Guarantee.

All plants shall be guaranteed to remain alive and healthy for two (2) full winters. A final inspection will be done by the Engineer at that time. Replacements shall be guaranteed an additional twelve (12) months. Inspection of the planting work, to determine its completion for beginning the guarantee period will be made by the Engineer upon notice requesting such inspection by the Contractor. All planting must be alive and healthy in order to be considered complete.

B. Final Inspection and Replacements.

Inspection of the planting to determine its final acceptance will be made at the conclusion of the guarantee period by the Engineer representative. No plants will be accepted unless they are alive and healthy. The Contractor shall replace any plants which are dead, or in the opinion of the Engineer, are in an unhealthy or unsightly condition, and/or have lost their natural shape due to dead branches. The cost of such replacement(s) shall be borne by the Contractor and shall be included in his bid price for this section of the Work.

C. Guarantee for Seeded Areas.

Areas failing to show an adequate germination of grass shall be replanted according to the instructions in Section 3.00 of the Specifications.

2.0 MATERIALS

2.01 Topsoil.

A. Topsoil will be stockpiled for re-use in landscape work. If quantity of stockpiled topsoil is insufficient, provide additional topsoil as required to complete landscape work.

B. Provide new topsoil for soil mix for backfill of trees and shrubs which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weds and other litter, and free of roots, stumps, stones larger than 23" in any dimension, and other extraneous or toxic matter harmful to plant growth.

C. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than four inches; do not obtain from bogs or marshes.

2.02 Soil Amendments.

A. Commercial Fertilizer. Complete fertilizer of neutral character, with some elements derived from organic sources and containing the following plant nutrient ratio: 20-20-5. Fertilizer shall be delivered to the site in unopened containers bearing the manufacturer's guaranteed analysis.

B. Foliar Fertilizer. All tree and shrubs shall be foliar fertilized with "Rapidgro" or similar fertilizer. Dilute and apply fertilizer according to manufacturer's specifications. Foliar fertilization must be complete within two weeks of planting.

2.03 Soil Mixtures.

A. Plant pits: Soil Mixture containing one part Colorado Mountain Peat to three parts topsoil. These materials must be thoroughly mixed so there is no visible segregation of materials.

2.04 Plant Materials.

A. Quality. Provide trees, shrubs and other plants complying with recommendations and requirements of ANSI Z60.1 *"Standard For Nursery Stock"* and as specified in Section 103.

B. Plant List. A complete list of plants including names, quantities, sizes and other requirements is shown on the Drawings. The plan shall have precedence over the plant list.

C. Deciduous Trees. Provide trees of height and caliper listed or shown and with branching configurations recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.

D. Deciduous Shrubs. Provide shrubs of the height shown or listed and with not less than minimum number of canes required by ANSI Z60.1 for type and height of shrub required.

E. Ground Cover. Provide plants established and well rooted in removable containers or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the pot size required.

F. Seed.

1. Seed shall be at least 95% pure and shall have a minimum germination rate of 85%. All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, lot number, net weight, the percent of week seed content and the guaranteed percentage of purity and germination. Seed and seed labels shall conform to all current state and federal regulations and will be subject to the testing provisions of the Association of Official Seed Analysis.

2. All seed mixes shall be free from such noxious weeds as Canadian Thistle, Coarse Fescue, European Bindweed, Johnson Grass and Leafy Spurge. The landscape contractor shall furnish to the Engineer a signed statement certifying that the seed furnished is from a lot that has been tested by a recognized laboratory. Seed which has become wet, moldy or in any other way damaged intransit or storage, will not be accepted.

3. Bluegrass Seed. Bluegrass seed shall be "Quicklawn" mix or approved equal by John Ericson, Ericson Enterprises, 481 Grand Valley Drive, Grand Junction, Colorado 81514, (303) 434-3339.

G. Sod. Provide strongly-rooted sod, not less than two years old and free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted (viable, not dormant). Provide sod composed principally of the following: 90% Kentucky Bluegrass (Poa pratensis).

2.04 Miscellaneous Landscape Materials.

A. Mulch. Mulch all planted areas with shredded bark or approved equal.

B. Stakes and Guys. Provide six-foot steel drive-in "T" posts. No. 125 for all tree staking. Provide wire ties and guys of two-strand, twisted, pliable galvanized iron wire not lighter than 12 gauge with zinc-coated turnbuckles. Provide not less than 0-inch hose, cut to required lengths, to protect tree trunks from damage by wires.

C. Fiber Mulch. Mulch shall be "Conweb Hydro-Mulch" 2000 (Conweb Corporation, Fibers Division, Box 43237, St. Paul, MN 55164) or suitable approved substitute.

3.00 METHODS AND PROCEDURES

3.01 Inspection. Installer must examine subgrade, verify elevations, observe conditions under which work is to be performed, and notify Contractor that unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.02 Preparation.

A. Layout. Layout individual trees and shrub locations by size and areas for multiple plantings. Stake locations and outline areas and secure Architect's acceptance before start of planting work. Make minor adjustments as may be requested. Prior to the excavation of planting areas or plant pits or placing tree stakes, the Contractor shall ascertain the location of all utility lines, electric cable, sprinkling system conduits so that proper precautions maybe taken not to disturb or damage any subsurface improvements.

B. Preparation For Planting Beds.

1. Loosen subgrade of planting bed areas to a minimum depth of eight inches using a cultimulcher or similar equipment. Remove stone over 10 inches in any dimension, and stick, stones, rubbish and other extraneous matter.

2. Spread planting soil mixture to a 4-inch depth required to meet lines, grades and elevations shown, after light rolling and natural settlement. Place approximately one-half of total amount of planting soil required. Work into top of loosened subgrade to crate a transition layer, then place remainder of the planting soil.

C. Excavation For Trees and Shrubs.

1. Excavate pits, beds and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.

2. For balled and burlapped (B&B) trees and shrubs, make excavation at least half again as wide as the ball diameter and equal to the ball depth, plus following allowance for setting of ball on a layer of compacted backfill.

3. Allow for six (6) inch setting layer of planting soil mix.

4. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.

D. Preparation for Planting Lawns.

1. Grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll and rake and remove ridges and fill depressions as required to meet finish grades., Limit fine grading to areas which can be planted immediately after grading.

2. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not crate a muddy soil condition.

3. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

4. Preparation of Unchanged Grades. Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows:

Till to a depth of not less than six inches, apply soil amendments and initial fertilizers as specified; remove high areas and fill depressions; till soils to a homogeneous mixture of fine texture free of lumps, cods, stones, roots and other extraneous matter.

3.03 Planting.

A. Planting Trees and Shrubs.

1. Set B&B stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades. Remove burlap from sides of balls; retain on bottoms. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets.

2. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

3. Set container grown stock as specified for balled and burlapped stock, except cut cans on two sides with an approved can cutter; remove bottoms or wooden bases after partial backfilling so as not to damage root balls.

4. Dish top of backfill to create a plant saucer with a four-inch lip.

5. Mulch around all plants with a two-inch layer of shredded bark. The boundaries of the mulched areas shall be the rim of the planting saucer or in shrub beds, the edge of the planting bed.

6. Staking and Guying. Stake and guy trees immediately after planting, as

indicated by planting detail on Drawings.

7. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by the Architect, do not cut tree leaders, and remove only injured or dead branches from flowing trees, if any. Prune shrubs to retain natural character and accomplish their use in landscape design.

B. Sodding New Lawns.

1. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen.

2. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering or adjacent grass.

3. Secure sod on slopes with wood pegs to prevent slippage. Water sod thoroughly with a fine spray immediately after planting.

D. Seeding.

1. Seeding rate: Bluegrass Seed Mix, 6000 lbs/1000 sq.ft.

2. Application. Seed shall be broadcast and uniformly raked to incorporate into the soil. Seeded areas shall be lightly mulched with clean straw.

3. Watering of Seeded Areas. Immediately after seeding and mulching of bluegrass areas, the Contractor shall water the seeded areas lightly and sufficiently to a depth of two inches, but with care so that erosion takes place and no gullies are formed. Damage and erosion from over-watering shall be repaired by or paid for by the Contractor.

E. Hydro-seeding.

1. Seed. All seed shall be delivered to the site tagged and labeled in accordance with the Colorado Agricultural Code and shall be acceptable to the County Agricultural Commissioner.

Seed shall be of a quality which as a minimum pure live seed content of 70% (% purity x $ germination), and weed seed shall not exceed 0.5% of the aggregate of pure live seed and other materials or a as standard for specific seed. The germination rate shall be 85%.

2. Fertilizer. A commercial fertilizer shall be ammonium phosphate and contain a minimum of 60 lbs. Actual available nitrogen, 50 lbs. actual available phosphoric acid and 25 lbs. actual available potash, uniform in

composition, dry solvable, pelleted or granular.

All fertilizer shall be delivered in unbroken and unopened containers, labeled in accordance with applicable State regulations and bearing the warranty of the producer for grade finished.

3. Mulch. (Wood Cellulose) shall be manufactured from Aspen, Alder or Hemlock (no waste paper, dairy waste fiber, ground straw, rice hulls, etc., can be used - only "virgin wood fiber" , i.e. "Conweb or Silva Fiber".

   The mulch shall be colored with a non-toxic water soluble green dye to provide a proper visual gauge for metering of material over ground surfaces. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with fertilizer, seed, water, and other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry;; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with seed; and which, after application, will allow the absorption of moisture and allow the rainfall to percolate to the underlying soil.

   Cellulose shall be certified to indicate that laboratory and field testing of the product has been accomplished and that it meets all of the foregoing requirements based on testing. Weight specifications of this material from suppliers and for all application shall refer only to air dry weight of the fiber material.

   Absolute air dry weight is based on the normal; standards of the *Technical Association of The Pulp and Paper Industry* for wood cellulose and is considered equivalent to 10% moisture.

4. Water. Water shall be clean, potable and added to the slurry mixture in sufficient amount to spread uniformly and required quantity of hydro-mulch solids (approximately 3000 - 4000 gallons per acre).

5. Organic Seeding Additive. Use "Ecology Control M-Binder" as per manufacturer's recommendations (apply at rate of 120 lbs/acre).

6. Seeding Requirements.

   a. Application of Seed: The Contractor shall obtain approval prior to application of the hydro-mulch seed.

   b. Seedbed Preparation: The area to be seeded shall have a firm seedbed which has been previously roughened by scarifying with the use of harrowing, cat tracks or other methods. Work to a depth of two inches to three inches. No implement shall be used that will crate an excessive amount of down-movement of soil or dods on sloping areas.

      Seedbed preparation shall be suspended when soil moisture conditions are not suitable for the preparation of a satisfactory

seedbed. This will be determined by the Project Inspector.

c. Fertilizing: The fertilizer shall be mixed and applied hydraulically in the form of a slurry. It shall be applied uniformly over the seedbed (i.e., 20-20-9 at 300 lbs.).

d. Seeding: Seed shall be distributed uniformly over the seedbed. The seed shall be added to the slurry mixture just before it is to be applied hydraulically to the seedbed and it shall not remain in the seeder longer than one hour. Seed source: Mile High Seed Company, 520 South 9th Street, P.O. Box 1988, Grand Junction, CO 81502) unless otherwise approved.

Seed

Wester Wheat Grass (50% split or as Slender Wheat Grass available)	50%
Green Needle Grass	6-1/4%
Candy or Upland Bluegrass	3-1/8%
Hard Fescue	9-3/8%
Creeping Red Fescue	9-3/8%
Kentucky Bluegrass "Troy"	3-1/8%
Mt. Sage (10% purity with 70% germination)	6-1/4%
Lupine Globe Mallow Scarlet Gilia (wildflower mix may vary) Phlox Aspen Daisy	6-1/4%
	1/5 lbs. PLS/1000

Contractor shall commence seeding immediately upon completion of grading and seedbed preparation. Additional spot seeding may be needed if area is disturbed.

All seeding shall be completed by July 1 (spring seeding) or October 15 (fall seeding) or as otherwise approved.

e. Mulching: The wood fiber mulch shall be applied uniformly with a hydraulic seeder at the rate of 2000 lbs/acre.

f. Equipment: Hydroseeder - Hydraulic equipment used for the application of the fertilizer, seed and slurry of prepared wood pump shall be of the type as approved by the Owner. This equipment shall have a built-in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry

containing up to 40 lbs. of fiber plus combined total of 70 lbs. fertilizer solids for each 100 gallons of water. The slurry distribution lines shall be large enough to prevent sloppage. This discharge line shall be equipped with a set of hydraulic spray nozzles which will provide a continuous non-fluctuating discharge and delivery of the slurry in the prescribed quantities uniformly without misses, waste or erosion. The slurry tank shall have a minimum capacity of 500 gallons and shall be mounted on a traveling unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution. The Owner may authorize equipment with smaller uniform distribution. The Owner may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.

3.04 Maintenance.

A. Begin maintenance immediately after planting. Maintain trees, shrubs and other plants until final acceptance but in no case less than 90 days after substantial completion of planting except as provided below for seeded areas. Maintain trees, shrubs and other plants by pruning, cultivating and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insect and disease.

B. At the completion of the maintenance period, the Contractor shall:

a. All plants that die or are in a badly impaired condition shall be removed and replaced.

b. Replacement stock shall be subject to all requirements specified for the original material.

c. Replacement stock shall be planted in accordance with the standard specifications. Maintenance requirements shall be specified below.

d. Acceptability of the plant material furnished and planted shall be determined after all replacement plant material is planted. The Contractor shall as necessary, employ all possible means to preserve the plants in a healthy and vigorous growing condition to ensure their successful establishment.

3.05 Clean-Up and Protection. During landscape work, keep pavement clean and work areas in an orderly condition.

3.06 Inspection and Acceptance.

A. When landscape work is completed, including maintenance, Engineer will, upon request, make an inspection to determine acceptability. Landscape work may be inspected for acceptance in parts agreeable to Engineer, provided work offered for inspection is complete, including maintenance.

B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Engineer and found to be acceptable. Remove all rejected plants and materials promptly from project site.

4.00 MEASUREMENT AND BASIS OF PAYMENT

See Bid Schedule

End of Section

SECTION 03100
CONCRETE FORMWORK

1.00 GENERAL

1.01 Scope. The work in this section consists of the design, furnishing, erecting and removing of forms for cast-in-place concrete.

1.02 Related Work Specified Elsewhere.

Section 03300 - Cast-in-Place Concrete
Section 03200 - Concrete Reinforcement

1.03 Quality Assurance.

A. Reference Standard. American Concrete Institute Standards (ACI). 301 Specifications for Structural Concrete for Buildings, Chapter 4, Formwork. ACI 347, Recommended Practice for Concrete Formwork (Chapters 1 through 5) as modified herein.

B. Design Criteria. Design formwork for the loads, lateral pressure and allowable stresses outlined in Chapter 1 of ACI 347.

C. Maximum Allowable Tolerances.

1. Variation from plumb:

a. Lines and surfaces of columns and walls in any ten feet of length, %- inch; in 40 feet or more, 112-inch.

b. Control joint grooves, and other conspicuous lines. In any 20 feet of length, %-inch; in 40 feet or more, 112-inch.

2. Variation from level or specified grade in slabs. In any 10 feet of length. %-inch; in 40 feet or more, 112-inch.

3. Variation of the linear building lines from established position in plan and related position of columns and walls. In any bay, 112-inch; In any 20 feet of length, 1/z-inch; in 40 feet or more, 1 inch.

4. Refer to ACI 301, Table 4.3.1 for additional requirements.

2.00 MATERIALS

2.01 General. Where "Smooth Form Finish", or "Grout Cleaned Finish" is specified, use prefabricated plywood panel forms, job-built plywood forms, forms lined with plywood, or steel forms. For reservoir walls, use two-foot wide form material to form the circular portion of the reservoir. The forms may be steel or plywood.

2.02 Steel Forms. Symons "Steel-Ply", Simplex "Industrial Steel Frame Forms", Universal "Uniform". Forms shall be clean, straight and true, without surface defects.

2.03 Plywood Forms. Product Standard PS-1, waterproof, resin-bonded exterior type. Forms shall be clean, straight and true, without surface defects.

2.04 Lumber. Straight, uniform width and thickness, clean and free from offsets, holes, dents and other surface defects.

2.05 Chamfer Strips. Clear white pine, surface against concrete planed.

2.06 Form Ties. Permanently embedded one-inch breakback cone ties with waterseal washers. Ties shall have a neoprene seal integral to the tie. Provide sufficient strength and rigidity to maintain forms in proper location without use of auxiliary spreaders. Form ties shall be uniformly spaced and aligned in vertical and horizontal rows.

2.07 Joints. Joints in circular reservoir shall be formed as shown on the Drawings.

2.08 Polyethylene Film. Product Standard PS-17; 6 mil. See Drawings for application at the top of the reservoir wall.

2.09 Form Bond Breaking Agent. Shall be non-staining agent that will allow the removal of forms without damaging or discoloring concrete.

3.0 EXECUTION

3.01 General. Erect forms substantially tight to prevent leakage of mortar and braced or tied to maintain the desired position, shape and alignment before, during and after concrete placement. At vertical wall joints where forms overlay existing concrete, a mortar-tight joint shall be required. Use a bead of silicone caulking or foam joint filler against concrete before placing form.

A. Provide temporary openings at the bottom of column and wall forms and at other locations where necessary to facilitate cleaning and inspection.

B. Temporary openings in wall or column forms used to limit the free fall of concrete to a maximum of four feet shall be located to facilitate placing and compaction of the concrete. Such openings in walls shall not exceed 10 feet laterally to avoid moving concrete laterally more than five feet.

C. If tremies of proper length are used for depositing concrete in walls or columns, temporary openings for concrete placement will not be required.

D. Whenever the top of a wall will be exposed to weathering, do not extend the forms on one side above the top wall; bring to true line and grade.

E. At other locations, bring forms to a true line and grade, or provide a wooden guide strip at the proper location on the forms so that the top surface can be finished with a screed or template for concrete which is to have a specified elevation, slope or contour.

F. Flat segmental forms not more than 24 inches wide may be used for forming curved surfaces 25 feet in diameter or larger.

G. Where concrete is placed against rock, remove all loose pieces of rock and clean the exposed surface with a high pressure hose.

H. The circular ring wall footing for the reservoir shall have a smooth steel troweled finish within the limits described on the Drawings.

3.02 Embedded Items. Anchor bolts, casting, steel shapes, conduits, sleeves and other materials that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored. Do not embed conduits, sleeves or other materials in the reservoir wall unless specifically shown on the Drawings.

A. Conduits shall not be installed in tank walls or slabs. Assure embedments are clean when installed.

B. At pipe penetrations where a steel weep ring is not called for, provide a watertight seal between the pipe and wall using "Ramneck" butyl sealant.

3.03 Preparation of Form Surfaces. Remove mortar, grout and other foreign material from form surfaces.

A. Coat form surfaces with form release agent before either the reinforcing steel, post-tensioning materials or concrete are placed. Do not allow form coating to:

1. Stand in puddles in the forms;

2. Come in contact with the reinforced steel; or

3. Come in contact with adjacent hardened concrete against which fresh concrete is to be placed.

3.04 Edges and Corners. Place chamfer strips in forms to bevel exposed edges and projected corners. Tool the top edges of walls and slabs not indicated on the Drawings to be beveled.

A. Form beveled edges for all vertical and horizontal corners of equipment bases unless indicated otherwise on the Drawings.

B. Chamfer strips shall be 3/4-inch, unless indicated otherwise on the Drawings.

3.05 Removal. Carefully remove forms only after concrete is able to support all dead and live loads and curing requirements are met. Apply potable water safe curing compound to all formed surfaces immediately after form removal.

A. Determine the strength of concrete from site cured cylinders, cured in the same manner as the formed concrete.

B. If job cured cylinder test reports are not available for formed concrete, the form supports shall remain in place for not less than the following periods of time. These periods represent cumulative number of days or fractions thereof, not

necessarily consecutive, during which temperature of the concrete is above 50 degrees Fahrenheit (50°F).

Walls and columns	48 hours
Reservoir top slab	Only after satisfactory Post-Tensioned. Reshoring shall not be permitted.

After removal, ends of metal form ties shall be recessed a minimum of one inch from surfaces. Form tie holes shall be patched with high-strength, non -shrink grout in a manner as to be permanent.

4.00 MEASUREMENT AND BASIS OF PAYMENT.

See Bid Schedule.

End of Section

SECTION 03200
CONCRETE REINFORCEMENT

1.00 GENERAL

1.01 Scope. The work in this section covers furnishing and installing steel bars and welded wire fabric for concrete reinforcement.

1.02 Related Work Specified Elsewhere.

Section 03100 - Concrete Formwork
Section 03300 - Cast-in-Place Concrete

1.03 Quality Assurance.

A. Reference Standards. American Concrete Institute Standards (ACI).

301 - Specifications for Structural Concrete for Buildings.
315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.
318 - Building Code Requirements for Structural Concrete.
350R - Concrete Sanitary Building Official Approved Structures.
344 - Design and Construction of Circular Pre-stressed Concrete Structures.

B. As modified herein or on the Drawings.

C. Allowable Tolerances. Fabrication Tolerances.

1) Sheared length: +1 inch

2) Depth of truss: +O, -1/2 inch for concrete thickness 24 inches or less and +O, -1/2 inch for concrete thickness over 24 inches.

3) Overall dimensions of stirrups, ties and spirals: +O, 1/2-inch for concrete thickness 24 inches or less and +O, -1/2 inch for concrete thickness over 24 inches.

4) All other bends: +1 inch.

D. Welding. Only ASTM A706 reinforcement may be welded and only with the approval of the Building Official.

1.04 Submittal of Shop Drawings.

A. Shop Drawings.

1. Show sizes, quantity and dimensions for fabrication and placing of reinforced bars and bar supports.

2. Indicate bar schedules, stirrup spacing, and diagram of bent bars.

3. Reinforcement shop drawings shall be submitted on reproducible. Provide

two sets of prints and reproducible.

B. Certificates. Mill test certificates identifying chemical and physical analysis of each load of reinforced steel delivered.

1.05 Product Delivery, Storage and Handling. Deliver to site in bundles marked with metal tags indicating bar size and length. Carefully handle and store on supports, which will keep the steel from coming in contact with the ground.

1.06 Job Conditions. Do not burn or weld in the vicinity of tendons.

2.00 PRODUCTS

2.01 Reinforcement Bars.

A. Bars. Steel reinforcement shall be new, deformed billet steel, meeting ASTM Standard A615 or A706; for rebars No. 4 and larger, Grade 60; for No. 3 rebars and designated reinforcement, Grade 40 or Grade 60.

1. Bend Test: Meet 180 degree bend at 60 degrees F. minimum temperature without cracking when bent around pin diameter indicated.

a. Number 3, 4 and 5 bars around pin diameter equal to 4 times nominal bar diameter.

b. Number 6 through 11 bars around pin diameter equal to 5 times nominal bar diameter.

2. Bend test for 14 and 18: Meet 90 degree bend at 60 degrees F. minimum temperature without cracking when bent around a pin diameter equal to 10 times nominal bar diameter.

B. Tie Wire. Annealed steel, Fed. Spec. QQ-W-461, 16- gauge minimum.

C. Bar Supports.

1. Conform to "Bar support Specifications", CRSI Manual of Standard Practice.

2. Where concrete surface will be exposed to fluids, view or weather, the supports or accessories shall be completely comprised of non-metallic material such as plastic or shall be completely plastic or epoxy coated.

D. Splice Devices. Provide *Thermite* (Cadweld) welding process only when called for on the Drawings. Where mechanical splice devices are called for on the Drawings, provide *Lenton* (or equal approved by Building Official) "Formsaver" threaded reinforcement splices to match the reinforcement size that the splice is intended to extend. Splices shall meet ACI 318-95, Chapter 12 strength criteria of developing 125 percent of the specified yield strength of the reinforcement bar it replaces. Install per manufacturer's recommendations.

E. Fabrication. In accordance with CRSI manual of Standard Practice, except for the allowable tolerances specified herein in Section 1.03 (C) of this specification.

2.02 Welded Wire Fabric. ASTM A185 or A497.

3.00 EXECUTION

3.01 Preparation. Remove all mud, oil, loose rust or mill scale and other foreign materials that may reduce bond. Rust or mill scale which is "tight" will be permissible without cleaning or brushing, provided weights, dimensions, cross sectional area, and tensile properties meet the requirements of ASTM A615.

3.02 Installation.

A. Bar Placement. Conform to CRSI-WCRSI "Placing Reinforcing Steel".

B. Bar Supports.

1. Provide minimum number of supports as required by ACI 315.

2. Do not use cobble, broken stone, common or face brick, metal pipe or wood blocks to support reinforcement.

3. On ground, where necessary, solid concrete bricks may be used to support wire chairs that, in turn, support the reinforcing steel in slabs on grade. Small squares of 1/2" plywood may be used to support chairs on the compacted subgrade.

C. Placement Tolerances.

1. Clear distance to formed surface: See Section D. Concrete Cover below.

2. Spacing between bars: ±1/4 inch, with minimum space not less than 1 inch or one bar diameter.

3. Top bars in slabs and beams: See Section D. Concrete Bar below.

4. Maximum bar adjustment to avoid interference with other reinforcing steel, conduit or embedded items:

a. One bar diameter.

b. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars may be rejected by Building Official.

D. Concrete Cover.

1. Except as otherwise indicated on the Drawings, provide the following minimum concrete cover for reinforcement:

a. Concrete cast against and permanently exposed to earth: 3”

b. Concrete poured in form, but exposed to earth,

weather or chlorinated water:

Bars larger than No. 5: 2”

Bars #5 or smaller: 1.5”

c. Beams: 2”

d. Walls and slabs (not exposed as in b. above): 1”

E. Reinforcing Adjustment. Do not heat, bend or cut bars without Building Official's approval.

F. Splices.

1. Do not splice bars except at locations shown on the Drawings without Building Official' approval.

2. Minimum slab distance shall be as shown on the Drawings. If not shown, splices shall be as specified in ACI 318.

3. Tie splices securely to prevent displacement during placement of concrete.

4. In horizontal wall reinforcement, alternate splice location vertically so that all splices are not in the same vertical plane.

G. Welded Wire Fabric.

1. Install in longest practicable length.

2. Lap adjoining pieces one full mesh plus 2 inches minimum.

3. Do not make lap midway between support members or directly over support members of continuous structures.

4. Offset lap in adjacent widths to prevent continuous lap.

5. Extend fabric through contraction joints and construction joint unless otherwise indicated on the Drawings.

4.00 MEASUREMENT AND BASIS OF PAYMENT.

See Bid Schedule.

End of Section

SECTION 03300
CAST-IN-PLACE CONCRETE

1.00 GENERAL

1.01 Scope. Work to be completed under this section shall include all labor, equipment, plant and materials necessary to furnish and install all poured-in-place concrete, together with all miscellaneous and appurtenant items, as shown on the Construction Drawings and as specified herein.

1.02 Related Work Specified Elsewhere.

Section 02200 - Excavation and Embankment
Section 02201 - Excavation and Backfill for Structures
Section 02222 - Embedment and Base Course Aggregate
Section 02626 - Concrete Curb & Gutter Sidewalk Curbwalk and Ramps

1.03 Reference Standards. Except as modified or supplemented herein, all work shall conform to the following standards, latest edition. Refer to standards for detailed requirements.

ACI 301 - Specifications for Structural Concrete for Buildings
ACI 305 - Recommended Practice for Hot Weather Concreting
ACI 306 - Recommended Practice for Cold Weather Concreting
ACI 318 - Building Code Requirement for Reinforced Concrete
ACI 347 - Recommended Practice for Concrete Formwork

Publication SP-2, ACI Manual for Concrete Inspection

ASTM A 615 - Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

ASTM A 185 - Specifications for Welded Steel Fabric for Concrete Reinforcement.

ASTM C 618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.

1.04 Submittals. The following shall be submitted to and approved by the Engineer prior to beginning any concrete work.

A. Lab Design Mix. Prior to the start of Work, Contractor to submit a statement of the proportions for the concrete mixture. Statement to include:

1. Location & identification of aggregate source.

2. Batch quantities for one (1) cubic yard of concrete, including:

a. Weight of fine aggregate in a saturated surface dry condition.

b. Weight of coarse aggregate in a saturated surface dry condition.

c. Weight or number of 94 pound bags of cement.

d. Weight or gallons of water.

e. Amount and description (including manufacturer, specific product name, and number) of all admixtures.

3. Test results on trial batch concrete made from the proposed mix design, including:

a. Cement factor in bags per cubic yard based on yield tests.

b. Water-cement ratio.

c. Percent of entrained air.

d. Consistency in inches of slump.

e. At least three 28-day compressive strength tests.

4. Brand, type and place of manufacture of cement.

5. Aggregate test results for grading, deleterious substances and physical properties using test procedures developed by ACI.

B. Reinforcing Steel. Product data sheet and statement of manufacturer's compliance with applicable standards.

C. Construction Joint Location. Location of all wall and slab construction joints.

1.05 Record of the Work. Contractor to keep a record of time, date and location of each concrete pour and submit these records to the Engineer.

1.06 Notice of Intention to Pour. Contractor shall notify the Engineer at least 48 hours before an intended cast-in-place concrete pour. No structural cast-in-place concrete shall be poured until all reinforcing, forms and foundation soils have been inspected by the Engineer.

1.07 Protection of the Work. Contractor to be responsible for protection of all Work prior to acceptance. In place concrete shall not be subjected to loadings or stress prematurely.

1.08 Storage of Materials. Cement and aggregate shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter.

A. Any material which has deteriorated or which has been damaged shall not be used for concrete.

B. All reinforcing steel shall be stored in a dry location and protected from excessive accumulation of rust or scale.

2.00 MATERIALS

2.01 Cement. All cement shall be Portland Cement Type II conforming to "Specifications for Portland Cement" (ASTM C 150-62). The same brand cement for all exposed cast-in-place concrete shall be used.

2.02 Stone Aggregate. Fine and course aggregate shall conform to "Specifications for

Concrete Aggregates" (ASTM C33-61T). Fine aggregates shall be clean, hard, natural and free from all foreign matter. Course aggregate shall be sound, crushed rock or gravel, free from adherent coating, organic water or injurious amounts of flat or friable pieces.

2.03 Water. Water used in mixing shall be potable, cleaned and free from deleterious amounts of oil, acids, alkalis and organic material.

2.04 Admixtures. "Protex" as manufactured by Protex Industries, Inc. and conforming to Specifications of Air-Entraining Admixtures for Concrete (ASTM C260) is an approved air- entraining admixture. Other admixtures for retarding or accelerating concrete may be used in strict accordance with manufacturer's recommendations and ASTM Specifications upon approval of the Engineer.

2.05 Form Material. For unexposed concrete surfaces, forms may be undressed lumber free from excessive knots. For exposed surfaces, use wood or metal forms as required to give finish as specified.

2.06 Reinforcing Steel. Reinforcing steel shall be deformed bars conforming to "Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement" (ASTM A615) and shall be Grade 60.

2.07 Welded Wire Fabric. Welded wire fabric shall conform to "Specifications for Welded Steel Fabric for Concrete Reinforcement" (ASTM A185) and shall have a minimum wire yield strength of 60,000 psi.

3.00 METHODS AND PROCEDURES

3.01 Concrete Mix.

A. Proportions. Concrete is to be proportioned according to laboratory designed mixes using the type of aggregate specified and producing the minimum of twenty-eight (28) day ultimate compressive strength as noted on the Construction Documents. All concrete shall be made with stone aggregate unless specifically noted, and no concrete shall have a 28 day compressive strength of less than 4,000 psi.

B. Cement and Water Content. The minimum quantity of cement used per cubic yard of concrete shall be 580 pounds. Water content shall not exceed 0.48 pounds water/pounds cement.

C. Air Entrainment. An air-entraining agent shall be added to all stone concrete so as to entrain 5%-8% by volume. Air-entraining agents shall be in strict accordance with the recommendations of the manufacturer and the testing laboratory for the design mix to assure strength requirements are being fully met or exceeded.

D. Mixing of Materials. The concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged. For job-mixed concrete, the mixer shall be rotated at the speed recommended by the manufacturer.

1. For stone concrete, mixing shall continue for at least one minute after all materials are in the mixer.

2. Ready mixed concrete shall be mixed and delivered in accordance with "Standard Specifications for Ready Mixed Concrete" (ASTM C94- 69).

3. Sufficient time shall be allowed for proper mixing on the concrete to provide uniformity throughout the batch.

4. Long delays in concrete placement shall be avoided and any concrete which has not been placed within one (1) hour after water has been added to the mix shall be rejected.

5. Over wet mixes shall be rejected and shall not be corrected by the addition of either aggregate or cement to the mixer.

6. Mix not less than ten minutes in transit mix trucks after addition of the mixing water.

E. Consistency. Slumps shall be minimum, consistent with placing requirements. Slump test shall be made in accordance with "Slump Test for Consistency of Portland Cement Concrete" (ASTM C143-58). Unless written approval is obtained from the Engineer, the maximum slump shall be three (3" ± 1") inches and the maximum size aggregate shall be one and one-half (1%) inches.

3.02 Concrete Forms.

A. Forms shall conform to the shape, lines, grades and dimensions of the concrete as detailed on the Construction Drawings. All forms for exposed finished surfaces shall be built with the material needed to produce the form, texture and design specified in Concrete Finishes of this section.

B. Design of Forms. Forms shall be sufficiently tight to prevent leakage of mortar and shall be properly braced or tied together so as to maintain the desired position. The form work shall be designed for the loads outlined in Part 3, Section 102 of "Recommended Practice for Concrete Form Work" (ACI 347-78). The forms shall be oiled for ease of removal of forms after setting of concrete.

C. Form Ties and Incidentals. Form ties shall be bolts and rods (adjustable for tightening) arranged so that no metal is within 3'4" of surface after removal of forms. Ordinary wire ties will be allowed with the specific approval of the Engineer. No ties through exposed concrete will be allowed. Set forms for all required anchors, bolt inserts, slots, sleeves, supports, etc., furnished under portions of this Specification and installed under this section.

D. Removal of Forms. Forms shall not be disturbed until concrete has hardened sufficiently to permit their removal with safety. The removal of the forms shall be carried out in such a manner as to insure the safety of the structure. Unless otherwise permitted by the Engineer, forms shall not be removed until 24 hours after pouring.

3.03 Construction and Expansion Joints. Expansion and control joints shall be constructed in accordance with Construction Drawings. Unless otherwise indicated on the Construction Drawings, install one inch (1") thick asphalt impregnated fiberboard expansion joint filler (ASTM D1752) wherever concrete slabs abut buildings or footings

or as shown on the plan details. All expansion joint filler shall extend the full depth of the slab.

3.04 Concrete Placement.

A. Preparation for Placing. Before placing concrete, all equipment for mixing and transporting concrete shall be cleaned and all debris and ice shall be removed from places to be occupied by concrete. Forms shall be properly treated and all reinforcement cleaned of ice and other coatings. Water shall be removed from place of deposit before concrete is placed.

B. Conveying. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of the materials. Equipment for chuting, pumping, or pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery and without separation of the materials.

C. Other Trades. Install by way of example, anchor bolts, reinforcing steel, pipe and conduit openings and sleeves, bearing plates, and knockouts as provided by other trades and as required by other trades. Provide minimum seven (7) days' notice to Engineer, Owner, or other trades prior to requiring materials or detailing information. Installation to meet location, dimension and alignment requirements of other trades.

D. Depositing. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the space between the bars. No concrete that has been partially hardened or been contaminated by foreign matter shall be deposited on the Work, nor shall re-tempered concrete be used. When concreting is once started, it shall be carried on as a continuous operation until the placing of the panel or section is completed. Place concrete in approximately horizontal layers avoiding displacement of reinforcement above fresh concrete and formation of seams and planes of weakness in sections. When construction joints are necessary, they shall be located as specified in this section under Construction Joints. For bonding fresh concrete, roughen and clean exposed surface and brush with neat cement grout. Place new concrete before grout takes initial set.

E. Compaction. Place concrete in layers not over twenty-four (24) inches deep; compact each layer by mechanical internal vibrating equipment supplemented by hand spading, rodding, tamping, as directed. Vibrators shall not be used to transport concrete inside forms. Limit vibration duration to the time necessary to produce satisfactory consolidation without causing objectionable segregation. Do not insert vibrator into lower courses that have begun to set.

F. Weather Conditions. Unless adequate protection is provided and the Engineer's approval is obtained, concrete shall not be placed during rain, sleet, or snow. When the mean temperature falls below 40°F for 3 successive days, concreting shall conform to "Recommended Practice for Cold Weather Conditions: (ACE 306 R-78). Concrete placed in hot weather shall meet the standards of "Recommended Practice for Hot Weather Concreting (ACI 305R-77). Concrete is not to be placed under water. A suitable means shall be provided for lowering the water level below surfaces upon which concrete is to be placed. This may require

excavating approximately twelve (12) inches below the bottom of the concrete surface and refilling with gravel and compacting. The groundwater shall not be allowed to rise to the bottom of the concrete until twenty-four (24) hours after the concrete has been completed. Water shall not be allowed to fall upon or run across the concrete during this period.

G. Protection and Curing. Concrete protection and curing shall be in conformance with ACI 308-71. Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected from loss of surface moisture. All concrete shall be kept in a moist condition for at least five (5) days after placement. Curing compounds may be used upon approval of the Engineer.

3.05 Slabs on Grade. All slabs on grade shall be poured directly on the vapor barrier and prepared gravel subgrade where shown on the Construction Drawings.

A. Construction joints shall be placed such that no section of slab is greater than twenty-five (25) feet on a side. Finishes, Expansion & Control Joints & Protection shall be as specified under other sections of this section.

B. Minimum six (6) inch Class 6 aggregate base course shall be installed under the entire slab unless otherwise directed by the Engineer.

C. The grading requirements as per Section 02222 for the aggregate course shall apply.

3.06 Concrete Finishes.

A. Patching. Patching shall be done on all concrete surfaces immediately after stripping forms; all exposed surfaces shall have fins and other projections carefully removed, offsets leveled, and voids saturated with water and patched to a true and even surface with a wood float. Patch all holes left by the removal of the form ties or bolts. Patching material shall be a stiff mixture of sand and cement, the color of which matches the concrete being patched. Any major area of faulty or honey- combed concrete shall be completely removed and patched at the direction of the Engineer.

B. Floor slabs. All concrete slabs shall be screened to levels or grades indicated and float finished monolithically completely free from humps or pits. Slabs shall not show surface deviation in excess of one quarter inch (1/4") when tested with a ten (10) ft. straight-edge. Before the finish has set, the surface cement film shall be removed with a fine brush in order to have a fine-grained, smooth but sanded texture.

C. Rubbed finish. All exposed concrete surfaces shall have a rubbed finish.

1. After removal of forms, rubbing of all exterior surfaces shall be started as soon as its condition will permit.

2. Immediately before starting this Work, the concrete shall be kept thoroughly saturated with water.

3. Sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing to thoroughly set.

4. Surfaces to be finished shall be rubbed with a medium course carborundum stone, using a small amount of mortar on its face.

5. The mortar shall be composed of cement and fine sand mixed in the same proportions as the concrete being finished.

6. Rubbing shall be continued until all form marks, projections and irregularities have been removed, all voids filled and a uniform surface has been obtained.

7. The paste produced by this rubbing shall be left in place.

8. After all concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water.

9. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

10. After the final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and objectionable marks.

D. Chamfer. All exterior corners shall receive 3/4" chamfer.

3.07 Reinforcing.

A. Placing Reinforcement. Reinforcing steel, at the time concrete is placed, shall be free from scale, rust or other coatings that will destroy or reduce bond.

1. Reinforcement shall be accurately placed as shown on the Construction Drawings and shall be adequately secured in position by concrete or metal chairs and spacers.

2. Reinforcing shall be furnished in the full lengths indicated on the Construction Drawings unless otherwise authorized by the Engineer. Splicing of bars, except where shown on the Construction Drawings or specified, shall not be permitted without written approval by the Engineer.

3. Reinforcement placed in any member shall be inspected before any concrete is placed and the Engineer shall be notified twenty-four (24) hours in advance before any concrete placement.

4. The placing, fastening, splicing and supporting of reinforcing steel and welded wire fabric shall be in accordance with the Construction Drawings and the latest edition of the CRSI "Recommended Practice for Placing Reinforcing Bars" and in accordance with ACI 318-77.

5. Bars shall be placed around all corners to splice steel in adjacent walls, footers and slabs (such detailing may not be shown on Construction Drawings).

B. Concrete Protection & Reinforcement. Where not otherwise indicated on the Construction Drawings, the minimum thickness of concrete over the reinforcement shall be as follows:

1. Concrete deposited against earth: 3"

2. Slabs and walls not exposed to weather or earth: 1"

3. All other concrete placed in forms:

For bars larger than #5:	2"
For bars #5 or smaller:	1-1/2"

C. Bearing Plates, anchor bolts, etc. Place all bearing plates, anchor bolts, reinforcing rods and other structural items furnished by other trades. Contractor to provide seven (7) -day notice to all such trades prior to affected pour. Installation to be within tolerances required by other trades.

4.0 FIELD QUALITY CONTROL

4.01 Concrete Tests. Six (6) inch x twelve (12) inch cylinders shall be taken at the point of placing in the forms, shall be job cured and tested in accordance with ASTM Standards by the Engineer. For each strength of concrete used, one set of four (4) cylinders for each day's pour, but not less than one (1) set of cylinders for each 100 cubic yards poured shall be taken. Two (2) cylinders at seven (7) days and two (2) cylinders at twenty-eight (28) days shall be tested. In addition, when in the opinion of the Engineer there is a possibility of the surrounding air temperature falling below forty (40) degrees Fahrenheit, additional specimens to be cured under job conditions may be required.

4.02 Enforcement of Strength Requirements. Should the strengths shown by the test specimens fall below the specified values, the Engineer shall have the right to require changes in proportions to apply on the remainder of the Work.

A. If concrete fails to meet the strength requirements of this specification, the Engineer may order the Contractor to have a testing laboratory, acceptable to the Engineer, take and test core samples of questionable concrete.

B. The Engineer may order all low-strength concrete removed and replaced if core strengths are below specified strengths. All costs connected with concrete coring and removal and replacement of low-strength concrete shall be borne by the Contractor.

C. Contractor shall repair all core holes at his expense.

4.03 Slump Tests. Engineer shall conduct slump tests on each day's pour and on individual trucks whenever concrete consistency varies. Test failure shall be grounds for rejection of individual or batch loads.

4.04 Air Content. Engineer shall conduct air tests on each day's pour and on individual trucks as determined by the Engineer. Test failure shall be grounds for rejection of entire batch until satisfactory tests are obtained.

5.00 MEASUREMENT AND BASIS OF PAYMENT

See Bid Schedule

End of Section

SECTION 04200

MASONRY

1.00 GENERAL

1.01 Scope. Work to be completed under this section shall include all labor, equipment, plant, and materials necessary to furnish and install all masonry units, together with all miscellaneous and appurtenant items required for installation and/or furnished by other trades, as shown on the Plans and as specified herein.

1.02 Related Work Specified Elsewhere.

Section 03300 - Cast-In-Place Concrete
Section 05100 - Structural Metal Framing
Section 05500 - Metal Fabrications
Section 10100 - Toilet Accessories
Section 15050 - Plumbing
Section 16000 - Electrical

1.03 Reference Standards.

ASTM C476 - Standard Specification for Mortar and Grout for Reinforced

Masonry ASTM C404 - Standard Specification for Aggregates for Masonry Grout

ASTM C144 - Standard Specification for Aggregates for Masonry Mortar

ASTM C55 - Standard Specification for Concrete Building Brick

International Masonry Industry, All-weather Council, "Recommended Practices and Guide Specification for Cold Weather Masonry Construction".

1.04 Submittals. Descriptive literature and catalogue cuts on masonry units, reinforcing steel and insulation.

1.05 Protection of Work. Contractor responsible for protection of all work prior to acceptance. Exposed insulation or cells shall be covered to prevent moisture or dirt intrusion.

1.06 Storage of Materials. Materials shall be stored in a dry place and in a manner to prevent damage or intrusion of foreign matter. During freezing weather, all masonry units shall be protected with tarpaulin or other suitable material. Concrete masonry units shall be stored under covers that will permit circulation of air and prevent excessive moisture absorption. Cement, lime and air-settling mortars shall be stored in watertight sheds with elevated floors. Reinforcement shall be protected from the elements; immediately before placing, reinforcement shall be free from loose rust, ice or other foreign coatings that will destroy or

reduce the bond. Concrete masonry units shall be protected against wetting prior to use. Deliver packaged material in original manufacturer's containers. Materials showing evidence of water or other damage are subject to rejection.

2.0 MATERIALS

2.01 Concrete Masonrv Units (CMU's). Units shall conform to ASTM C90 specifications.

A. All units shall be Type I.

B. Units below grade or exposed to weather shall be Grade N.

C. Other units may be Grade S.

D. Crushing strength, f'm = 1350 psi.

E. Units shall be in modular sizes with standard 8" width or 4" width as required. Corner units shall have square external corners.

F. Jamb units at windows, bond beam units and other special units shall match the approved samples for the type of construction and locations designated.

G. Units shall not contain iron spots or other substances that will strain plaster or paint.

2.02 Joint Reinforcement. Steel reinforcement for use in horizontal bed joints of concrete masonry units and other locations as hereinafter specified shall be prefabricated truss design type formed of zinc-coated cold drawn steel wire conforming to ASTM A82 and A116 of Class 3 coating.

A. Side wire shall be formed of 9 gauge rod; cross rods shall be of 9 gauge, smooth or deformed wire, butt welded to side wires in the same plan at contact points.

B. Special formed pieces shall be provided at corners and wall intersections.

C. Reinforcing shall be of proper widths for the wall thicknesses shown.

D. Reinforcing shall be Standard Type Fur-0-Wall, Rewal or approved equal.

E. Unless otherwise noted on the plans, reinforcement in masonry walls shall be installed in the first and second bed joints above lintels, below sill at openings and below bond beams around the entire top of the perimeter walls of the building.

F. Elsewhere, reinforcing shall be installed in bed joints at 16" vertical intervals. Side rods shall be lapped horizontally a minimum of 6".

G. Joint reinforcement embedded in horizontal mortar joints shall have not less than 5/8" mortar coverage from the exposed face.

2.03 Reinforcing Steel. See Section 03300, Part 2.07.

2.04 Mortar and Grout. Shall conform to the property requirements of ASTM C476. Proportion mix to meet strength and other requirements.

2.05 Portland Cement. See Section 03300, Part 2.01.

2.06 Loose Fill Insulation. Zonolite, Permalite or approved equal water-repellent masonry fill insulation.

2.07 Masonry Cement. Cement shall conform to ASTM Specification C91. Cement shall be gray.

2.08 Lime. Hydrated lime shall be Type S conforming to ASTM Specification C207. Quicklime shall conform to ASTM Specification C5; it shall be slaked in accordance with the manufacturer's directions.

2.09 Lime Putty. Putty shall be a stiff mixture of lime and water. Keep putty moist until used. Putty made from quicklime shall be slaked and allowed to soak at lest 24 hours before using. Putty made from Type S hydrated lime may be used immediately after mixing.

2.10 Sand. Sand shall conform to ASTM Specification C144 except that sand for mortar in 1/4 inch wide joints shall pass a No. 16 sieve.

2.11 Mixing Water. Water shall be clean and potable.

2.12 Coarse Aggregate for Masonry Grout. Aggregate shall conform to ASTM Specification C404.

3.0 METHODS AND PROCEDURES

3.01 Mixing Mortar. Mix all ementitious materials and sand in a mechanical batch mixer for a minimum of 5 minutes.

A. Adjust the consistency of the mortar to the satisfaction of the mason, but add only as much water as is compatible with convenience in using the mortar.

B. If the mortar begins to stiffen from evaporation or from absorption of a part of the mixing water, re-temper the mortar immediately by adding water and remix the mortar.

C. All mortar shall be used within 2 1/2 hours of the initial mixing. It shall not be used after is has begun to set.

3.02 Other Trades. Other trades shall be consulted and provisions made such that the installation of their work is permitted in a manner to avoid butting and patching.

A. Install, by way of example, anchor bolts, bearing plates, pipe and conduit openings and sleeves, HVAC openings and other knockouts required by other trades.

B. Provide minimum 7-day notice to Owner, Engineer and other trades prior to requiring materials or detailing information.

C. Build in work specified under other sections, as necessary and as the work progresses in accordance with requirements or other trades.

D. Masonry contractor not responsible for installation of materials running within walls such as concealed conduit and piping.

3.03 Laying Masonry Units. All units shall be set plumb and true to line. All units shall be laid with level horizontal joints.

A. Units shall be lain in "running bond" unless otherwise shown.

B. All interior masonry partitions unless otherwise shown shall terminate 1/2 inch from structural ceilings and a 1/z-inch thick by 8-inch wide expansion joint material installed thereon.

C. Where electric conduit, outlet and switch boxes occur, units shall be ground and cut before building in service.

D. Work shall be coordinated with electrical subcontractor.

E. Cutting of all units exposed in finished work shall be done with an approved type of power saw.

F. Work must also be coordinated with plumbing subcontractor where plumbing

occurs in masonry partitions.

G. Masonry units shall be reinforced horizontally with continuous joint reinforcement placed not to exceed 16" on center vertically in exterior walls and in non-load bearing partitions.

H. Bond each course at corners in a masonry bond and at intersections with metal ties, anchors or joint reinforcement spaced as above.

I. Partitions of all units that abut exterior walls, columns and other partitions shall be bonded in or be anchored thereto once every sixteen (16) inches in height. Where anchors are used they shall be one-eighth (1/8) x 1.25-inch zinc coated steel anchors with ends turned up two (2) inches and extending four (4) inches into wall and not less than 8 inches onto partitions; or anchors may be of type to fit the slats in concrete.

J. Interior joints of all masonry construction shall be "flush". Exterior joints of all masonry construction shall be "concave".

3.04 Special Requirements. Masonry shall not be laid when the temperature of the outside air is below forty (40) degrees Fahrenheit, unless suitable means as approved by the Engineer are provided to heat materials, protect work from cold and frost and ensure that mortar will harden without freezing. (No anti-freeze ingredient shall be used in the mortar).

A. The facing material shall be protected against staining and tops of walls kept covered with non-staining waterproof coverings when work is not in progress. When work is resumed, top surface of work shall be cleaned of all loose mortar and in drying weather thoroughly wet except for concrete masonry units.

B. Where fresh masonry joins masonry that is partially set or totally set, clean the exposed surface of the set masonry and wet it lightly so as to obtain the best possible bond with the new work.

1. Remove all loose brick and mortar.

2. If it is necessary to "stop off' a horizontal runt of masonry, this shall be permitted only with the Engineer's approval. (Toothing will not be permitted).

C. All reinforced hollow unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled.

1. Walls and webs forming such cells to be filled shall be full bedded in mortar to prevent leakage of grout.

2. All head (or end) joints shall be solidly filled with mortar for a distance of the longitudinal face shells.

3. Bond shall be provided by lapping units in successive vertical courses or by equivalent mechanical anchorage.

D. Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than two (2) inches by three (3) inches.

E. All cells containing reinforcement shall be filled solidly with grout. Grout shall be poured in lifts of eight (8) feet maximum height. All grout shall be consolidated at time of pouring by puddling or vibrating and then reconsolidated by again puddling later, before plasticity is lost.

F. When total grout pour exceeds eight (8) feet in height, the grout shall be placed in four (4) foot lifts and special inspection during grout shall be required. Minimum cell dimension shall be three (3) inches.

G. When the grouting is stopped for one (1) hour or longer, horizontal construction joints shall be formed by stopping the pour of grout 1.5 inches below the top of the uppermost unit.

H. Steel in lintels shall be set in beds of mortar. Spaces around jambs and heads of metal door bucks and frames shall be filled solidly with mortar.

I. Bond beams or concrete caps along the top of the walls shall be provided with the necessary and required bearing plates, anchor bolts, expansion joint filler, etc. and welds and connections of the pre-cast concrete components to the walls shall be made by the contractor under this section.

3.05 Insulation. Loose fill insulation shall be poured directly from the bag. Block joints at columns or other vertical members shall be mortared in to prevent leakage. All block throughout the entire job is to be filled except interior partitions.

4.0 FIELD QUALITY CONTROL

4.01 General. All mortar smears and mortar chucks shall be cleaned from all exposed surfaces or surfaces to receive paint.

A. Point all joints as directed by Engineer removing joint material sufficient to allow uniform joint after repair.

B. Receive approval of finished wall.

5.00 MEASUREMENT AND PAYMENT

See Bid Schedule

End of Section