



GENWAL COAL COMPANY

August 29, 1990

File in:

Confidential

Shelf

Expandable

Refer to Record No. 0147 Date 0522 1991

In C 015 00 32 Incoming
For additional information

George Morris
Manti- Lasal National Forest
599 Price River Drive
Price, UT. 84501

RE: Surface Treatment / Road-Use permit asphalt schedule for the Crandall Canyon Road, FDR no. 50248.

Dear Mr. Morris:

I am writing to inform you and your staff that Genwal Coal Co. has resurfaced Crandall Canyon road, from the Huntington Canyon Creek, to the Genwal Mine site, with approximately 6 inches of gravel sub-base. In addition with this resurfacing, Genwal Coal Co. has applied magnesium chloride to the road base as a surface treatment required by the maintenance clause of our road-use permit.

We feel that this surface treatment and method of treatment will effectively minimize surfacing losses from now to the spring of 1991. In addition to the surface treatment Genwal Coal Co. commits to monitor our snow removal process. A new snow plow will be purchased and care will be taken to maintain road drainage, and minimize snow spillage over the outslope.

Genwal's road-use permit states; "If surface treatments prove to be inadequate an asphalt surface shall be applied. This shall be applied at such time as surface treatments fail to prevent surfacing losses, and effective fugitive dust control".

In response to the road-use permit, Genwal Coal Co. would at this time provide you with the following schedule for placement of an asphalt surface on the Crandall Canyon Road:

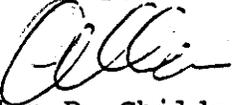
- I. As built drawings of the existing Crandall Canyon Road (Nov.1990).
- II. Surface design (Dec. 1990).
- III. Typical road template and road cross section (Dec. 1990).
- IV. Preliminary road construction (June 1991).
- V. Placement of gravel sub-base (June 1991).

VI. Asphalt / asphalt equivalent placement (July 1991 during miners vacation).

I respectfully request that your staff review the surface treatment and road-use permit information as stated above. As part of your review process, I would ask that you notify the Division of Oil, Gas, and Mining of this proposed schedule for the existing Genwal Coal Co. road-use permit.

Should you have any questions or need additional information please contact me at 687-9813 at your convenience.

Sincerely,



Allen P. Childs
Vice Pres./Mine Manager
Genwal Coal Co.

United States
Department of
Agriculture

Forest
Service

Manti-LaSal
National Forest

599 West Price River Dr.
Price, Utah 84501

Reply to: 7730

Date: September 5, 1990

Mr. Allen P. Childs, Mine Manager
Crandall Canyon Mine
Genwal Coal Company
P.O. Box 1201
Huntington, UT 84528

Dear Allen:

I am in receipt of your letter of August 29th advising the Forest Service of your schedule to pave the Crandall Canyon road pursuant to the terms of your road use permit. The schedule is satisfactory. The road design to be submitted in December must include design parameters including projected vehicle configuration and trips per day, as well as strength characteristics of the road bed, including gravel depths.

The combined Forest Service/DOGM/Genwal meeting and mine site review was very fruitful. Your cooperation and coordination in the matters of the various Forest Service and DOGM permits is appreciated.

Sincerely,



AARON L. HOWE
Forest Engineer

ROAD USE PERMIT
(Re: FSM 7770)

Acts of 6/30/14, 4/24/50, 6/12/60, and 10/14/64;
(16 U.S.C. 498, 572, 530, and 532-38)

Genwal Coal Company
(Name)

of P.O. Box 38, Orangeville, Utah 84537
(Address and ZIP Code)

(hereafter called the permittee) is hereby granted use of the following road(s) or road segments:

Crandall Canyon Road, F.S. No. 50248 (approximately 1-1/2 miles from the junction of FH-7 to construction station 88+46.87).

on the Manti-LaSal National Forest, subject to the provisions of this permit including clauses 2-1 through 18, on page(s) 1 through 4 for the purpose of hauling coal from the Genwal Coal Company Mine.

The exercise of any of the privileges granted in this permit constitutes acceptance of all the conditions of the permit.

~~1. INVESTMENT SHARING RATES. The permittee shall...~~

~~2. Funding of maintenance...~~

2-1. WORK REQUIRED TO ACCOMMODATE PERMITTED USE. In accordance with this use, the permittee shall perform the work described below and in accordance with plans and specifications attached hereto: The work required shall include the construction of 1-1/2 miles of road and a 60-foot double-lane bridge across Huntington Creek, including eight (8) inches of gravel sub-base to be placed over the entire constructed road. (See attached continuation.)

WORK PERFORMANCE SCHEDULE. (Construction of required improvements or reconstruction will be completed ~~before hauling commences.~~)¹ Work shall be performed in accordance with the attached schedule. ~~...~~ (See attached continuation.)

~~2-2. COOPERATIVE WORK. Although...~~

~~Upon satisfactory performance, credit will be allowed in the total of...~~

~~2-3. CASH DEPOSITS REQUIRED IN LIEU OF WORK PERFORMANCE. The permittee...~~

~~2-4. COST RECOVERY. In consideration for this use, the permittee shall deposit with the Forest Service...~~

This permit is accepted subject to all of its terms and conditions.

ACCEPTED	Permittee (Name and Signature) <i>William C. Wan</i>	Date <i>May 21, 1981</i>
APPROVED	Issuing Officer (Name and Signature) <i>William H. Baly</i>	Tide <i>Assistant Supervisor</i>
	(over)	Date <i>5/21/81</i>

¹ Delete if not applicable.

~~PAYMENT GUARANTEE. The permittee shall pay the full amount of any and all payments due in a penal sum of not less than \$ _____ guaranteeing payment for road use up to this amount, or in lieu thereof depositing in a Federal depository, through the Regional Fiscal Agent, and maintains therein negotiable securities of the United States having a market value in like sum and agreement authorizing the bond approving officer to sell or collect such securities if payment is not made within _____ () days of request therefor. The Forest Service shall permit road use in advance of cash payment up to the penal sum of such bond or market value at time of deposit of negotiable securities; provided, that regardless of the penal sum of such payment bond or the value of such deposited securities, the permittee shall pay cash within _____ () days of request therefor, for all road use performed. If any payment is not received within _____ () days of request therefor, the Forest Service may suspend all hauling under this permit until payments due are received, and may take such action as is necessary to collect such payments from the payment guarantee surety, or by sale or collection of securities guaranteeing payments. In the event the permittee fails to make payment and collection is obtained from the surety, or from the sale or collection of the deposited securities, the Forest Service may thereafter require the permittee to make payments in advance of road use.~~

~~2. USE PLANS. The permittee shall submit to the Forest Service in writing of the approximate time when such use will commence, the anticipated duration of such use, the names and addresses of permittee's contractors or agents who will use the road on behalf of permittee, the estimated extent of use, and such other information relative to permittee's proposed use as the Forest Service may from time to time reasonably request. If and when during the year there is any significant change with respect to the information so supplied by permittee, the permittee will notify the _____ promptly in writing of such change. Plans and changes will be _____ before use may commence.~~

~~4. USE RECORDS. The permittee shall maintain and preserve for the Forest Service, upon request, all records, including maps, notes, reports, and other documents, which give the nature, extent, and results of road use, in compliance with the provisions of this permit.~~

5. COMPLIANCE WITH LAWS AND REGULATIONS. The permittee, in exercising the privileges granted by this permit, shall comply with the regulations of the Department of Agriculture and all Federal, State, county and municipal laws, ordinances or regulations which are applicable to the area or operations covered by this permit.

6. USE NONEXCLUSIVE. The privileges granted in this permit to use this road are not exclusive. The Forest Service may use this road and authorize others to use it at any and all times. The permittee shall use said road in such manner as will not unreasonably or unnecessarily interfere with the use thereof by other authorized persons, including Forest Service.

7. RULES GOVERNING USE. The permittee, its agents, employees, contractors or employees of contractors, shall comply with all reasonable rules prescribed by the Forest Service for control and safety in the use of this road and to avoid undue damage to the road. Such rules will include:

- (1) Upon reasonable notice, closing the road or restricting its use when, due to weather conditions, or the making of alterations or repairs, unrestricted use would in Forest Service judgment, cause excessive damage, or create hazardous conditions;
- (2) Upon reasonable notice, closing the road during periods when, in Forest Service judgment, there is extraordinary fire danger;
- (3) Traffic controls, which in Forest Service judgment, are required for safe and effective use of the road by authorized users thereof;
- (4) Prohibition upon the loading of _____ trucks while such trucks are standing on the roadway surface, except to recover lost _____ material.
- (5) Prohibition on the operation on this road of any vehicles or equipment having cleats or other tracks which will injure the surface thereof;

(6) Prohibition on the operation of ~~h~~-hauling vehicles (of a width in excess of state legal limit and with a gross weight of vehicles and load in excess of state legal limit)¹ (in excess of legal highway loads in the State).¹

(7) Regulation of the number of vehicles so as to prevent undue congestion of this road.

(8) The Permittee shall not use an "active ingredient" as defined in Section 2 of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended (86 Stat. 973), in violation of said act on the land described in this permit.

(9) Other—Specify (Optional)

a. The operator shall limit hauling truck speeds to 20 miles per hour.

b. A sign, warning other road users of heavy truck traffic, shall be placed at or before the bridge.

8. INSURANCE. Permittee shall be required to carry public liability and property damage insurance for the operation of vehicles. In the amounts established by applicable State laws, cooperative agreements, or easements issued on the subject road or roads. In any event, the permittee must carry liability insurance and property damage insurance of not less than \$ 100,000 for injury or death to one person, \$ 300,000 for injury or death to two or more persons, and \$ 50,000 for damage to property. Proof of satisfactory insurance may be required by the Forest Service prior to hauling over this road and will be for the duration of the permit, ~~and such insurance policy shall have an endorsement requiring the issuing company to give _____ days prior written notice to the Forest Supervisor of cancellation or material change~~

9. MAINTENANCE. The permittee shall bear the expense of maintenance proportionate to his use. This expense will be borne by Genwal Coal Company, its agents and other users. Until such time as other use occurs, Genwal Coal Company shall perform all maintenance. At such time as other use commences, the Forest Service will determine the proportionate share of maintenance responsibilities for which each of the parties is to accomplish. The maintenance will be reapportioned based on both number and type of vehicles using the road, as well as the season of use.

~~When deposits or payments are required in lieu of performance of maintenance, the permittee shall be required to deposit such amount in a Federal depository, as directed by the Forest Service, and shall maintain therein cash in the sum of _____ dollars (\$ _____), or negotiable securities of the United States having market value at time of deposit.~~

Maintenance shall be performed in accordance with Forest Service specifications or requirements for maintenance as hereinafter listed, or as may be mutually agreed upon from time to time and shall consist of (1) current maintenance as necessary to preserve, repair, and protect the roadbed, surface and all structures and appurtenances, and (2) resurfacing equivalent in extent to the wear and loss of surfacing caused by operations authorized by this permit.

9a. MAINTENANCE AND RESURFACING REQUIREMENTS AND SPECIFICATIONS. (Specify)

Maintenance shall be performed on a routine recurring interval and shall be done in a manner that will preserve the road material and retain the road surface. Dust will be controlled, soft slopes will be reinforced, and rutting and road corrugation will be removed. See attached Maintenance Specification Exhibit I.

10. PERFORMANCE BOND. In the event the permittee is to perform his proportionate share of road maintenance, road resurfacing, or betterment, as determined and within time periods established by the Forest Supervisor, the Forest Service may require as a further guarantee of the faithful performance of such work that the permittee furnish and maintain a surety bond satisfactory to the Forest Service in the sum of _____ dollars (\$ 165,000.00), or in lieu of a surety bond, deposit into a Federal depository, as directed by the Forest Service, and maintain therein cash in the sum of _____ dollars (\$ 165,000.00), or negotiable securities of the United States having market value at time

¹ Delete inapplicable clause.

of deposit of not less than _____ (\$ 165,000.00). As soon as security for the performance of road maintenance (and betterment) requirements or the settlement of claims incident thereto is completed, unencumbered cash guarantees or negotiable securities deposited in lieu of surety bond will be returned to the permittee.

11. **FIRE PREVENTION AND SUPPRESSION.** The permittee shall take all reasonable precautions to prevent and suppress Forest fires. No material shall be disposed of by burning in open fires during the closed season established by law or regulation without a written permit from the Forest Service.

12. **DAMAGES.** The permittee shall exercise diligence in protecting from damage the land and property of the United States covered by and used in connection with this permit, and promptly upon demand shall pay the United States for any damage resulting from negligence, or from violation of the terms of this permit or of any law or regulation applicable to the National Forests, by the permittee, or by his agents, contractors, or employees of the permittee acting within the scope of their agency, contract, or employment.

13. **OFFICIALS NOT TO BENEFIT.** No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise herefrom unless it is made with a corporation for its general benefit.

14. **OUTSTANDING RIGHTS.** This permit is subject to all outstanding rights.

15. **SUSPENSION.** Upon the failure of the permittee, its agents, employees or contractors to comply with any of the requirements of this permit, the officer issuing the permit may suspend operations in pursuance of this permit.

16. **TERMINATION.** This permit shall terminate on June 1, 1986, unless extended in writing by the Forest Service. It may be terminated upon breach of any conditions herein. This permit shall be reviewed annually and is subject to revision at such time as conditions of use change.

17. In the event of any conflict between any of the preceding printed clauses or any provision thereof and any of the following clauses or any provisions thereof, the following clauses will control.

18. The environmental assessment prepared and approved for this activity shall be made a part of this permit. This permit is subject to the requirements, constraints, and mitigations developed in that assessment. (Copy attached.)

2-1. Work Required to Accommodate Permitted Use

The work will be performed in accordance with the plans submitted by the Permittee and approved by the Forest Service. The plans, specifications, and construction details shall be used and adhered to as follows:

- A. The work shall be constructed in accordance with Forest Service Standard Specifications for Construction of Roads and Bridges, dated 1979, unless alternate specifications are submitted by the Permittee. Any alternate specifications must be approved by the Forest Service.
- B. The Permittee shall supply all the materials, corrugated metal pipe culvert, and gravel surfacing, concrete, and other materials needed to construct the road and bridge.
- C. The Permittee shall provide quality control inspections during construction. Such inspection will include but not be limited to:
 1. That pipe materials are of the proper size, shape, gage, and quality as specified.
 2. That compactive effort is maintained as specified through in-place density tests. This action will require that the Permittee obtain moisture density curves for field samples prior to beginning construction activities.
 3. That aggregate surfacing gradations meet the specifications.
 4. That constructed sections conform to the lines and grades as shown on the plans and staked on the ground by the Permittee.
- D. The Inspectors provided by the Permittee shall be qualified to take the tests called for in the specifications. The Inspectors shall certify in writing that the work and materials comply with the specifications.
- E. Where materials are delivered to the job site, certification shall be made and given to the Forest Service prior to installation of the materials. A copy of the supplier's certification shall be forwarded to the Forest Service.
- F. In the specifications, the term "Contractor" refers to the Permittee, Genwal Coal Company. The term "Engineer" refers to the person or persons designated by the Permittee as their Project Engineer. Inspection by the Forest Service will be done to insure that the Permittee's Inspectors require compliance with the specifications.
- G. The term "Contracting Officer" refers to the Forest Supervisor.
- H. The Permittee will take the necessary steps to obtain a responsible contractor, as determined by a review of said contractor's past performance and financial capabilities. Said contractor will be agreeable to all parties of this permit.
- I. A preconstruction meeting with the Permittee, Construction Contractor, and the Forest Service will be arranged after the project has been staked and prior to construction.

- J. The following are highlights of the major items of Forest Service Standard Specifications that will be emphasized. This is not an exclusive listing, but only emphasizes those items not clearly covered in the Permittee's Engineering Report and Design:

Section 170 - Construction Staking

- 170(01) Construction Staking, Transit L-Line, Precision B
- 170(05) Slope Stake, Precision C
- 170(06) Finish Staking, Base Course, Precision B

Section 201 - Clearing and Grubbing

- 201(01) Clearing and Grubbing, Slash Treatment methods for Tops and Limbs: Piling and Burning, Removal, Logs: Piling and Burning, Removal, and Stumps: Piling and Burning.

Section 203 - Excavation and Embankment

- 203(03) Excavation, Placement Method 3, Tolerance Class B
- 203(11) Embankment, Placement Method 3, Tolerance Class B
- 203.15 Embankment Placing Methods

Method 3. Controlled Compaction. Delete, AASHTO T99 Method C or D, from the last sentence of the first paragraph and add ASTM D 1557-70, Method C.

Section 304 - Aggregate Base or Surface Course

- 304(10) Crushed Aggregate, Type - Base, Grading - D, Compaction - B.

2-1. Work Performance Schedule:

- A. All construction, including the placement of 8 inches of gravel sub-base, shall be completed before hauling can commence. It is suggested that a surface treatment be applied as soon as possible to reduce maintenance requirements and to eliminate fugitive dust or prevent surfacing losses.
- B. In any event, 15 months after haul operations begin, surface treatment must be applied. Until that time, sprinkling will be an acceptable means of dust control.
- C. If surface treatments prove to be inadequate, an asphalt surface shall be applied. This shall be applied at such time as surface treatments fail to prevent surfacing losses and effective fugitive dust control. This shall occur no later than 40 months after coal haul commences, if these conditions exist.
- D. The segment of roadway from the shoulder of Forest Highway 7, Station 10+50 thru Station 13+00, shall be asphalt surfaced by October 1, of the first construction season.

MAINTENANCE REQUIREMENTS

EXHIBIT I

Road Maintenance. Road maintenance is defined as the performance of work on the entire road facility commensurate with Permittee's use. This work consists of restoration and preservation of surface, shoulders, roadsides, structures, drainage, sight distance, and such traffic control devices as are necessary for prevention of excessive erosion damage to the facility and adjacent lands.

- I. Description. Maintenance work to be done currently during the periods of use by the Permittee shall include:
 - A. Removal of slides, boulders, which obstruct safe sight distance.
 - B. Adequate blading and shaping of roadway surfaces and ditches to maintain the original cross sections.
 - C. Removal of earth and debris from ditches and culverts so that the drainage systems will function efficiently at all times.
 - D. Prevention of excessive dusting of road surface materials.
 - E. Repair of damages to fences, cattleguards, culverts, and other roadway structures, including traffic regulatory and directional signs.
 - F. Restoration of eroded fills and repair and protection of shoulder berms, berm outlets, stabilized waterways, vegetated slopes, and other erosion control features.
 - G. Removal of snow from roadway surface.
 - H. Replacement of roadway and/or surfacing material worn out and lost through use of the roadway.
- II. Performance. All items of maintenance work shall be done currently as necessary to insure safe, efficient transportation and to protect roads, streams, and adjacent lands from excessive damage. Work shall be done in accordance with the following minimum standards of performance:
 - A. Removal of Material. Earth, rocks, trees, brush, and debris removed from roadways and ditches shall not be deposited in stream channels or upon slope stabilization and erosion control features. Areas for disposal will be designated by the Forest Service prior to deposition.
 - B. During roadway blading and shaping operations, banks shall not be undercut nor shall gravel or other selected surfacing material be bladed off the roadway surface. The original crown or slope of the road shall be preserved. Mud, debris, and oversize material shall be deposited outside the roadway by hand or by careful blading, and these materials shall not be mixed with the road surfacing material.

- C. Ditches, culverts, drop inlets, trash racks, downspouts, and splatter structures shall be kept clear of earth, slash, and other debris so that drainage systems will function efficiently during, and immediately following, periods of road use by Permittees. This includes correcting and eliminating causes of erosion or plugging of the structure, and actual repair of the structure and riprap if damaged.
- D. Fugitive dust shall be controlled to prevent hazardous driving conditions or loss of road surface or binder material. The Permittee shall control such dusting by sprinkling, surface treatments, and/or bituminous pavements. See Clause 2-1 for schedule.
- E. Permittee shall promptly repair all damages, caused by the Permittee's operations, to the road surface or to any structures in or adjacent to the roadways.
- F. Any washing or settling or roadway fills shall be corrected promptly to prevent additional soil erosion or roadway damage. Shoulder berms, berm outlets, and stabilized waterways shall be protected during road maintenance operations and, if damaged, such structures shall be promptly restored to their original condition including repair and reseeded of vegetation established to control slope erosion. No earth, rocks, or other debris shall be deposited upon any roadside slope stabilization structure or feature.

G. Snow Removal

1. Requirements

- a. Before any snow removal can begin, advance notice must be given prior to the starting of snow removal operations.
- b. Equipment - The equipment should be in sound operating condition, be equipped with angle blade or adequate grousers or traction tires, and be operated by a fully qualified operator.
- c. Removal

Width - Snow will be removed to the full width of the road plus any turnouts and ditch lines. Through-cuts will be allowed only after snow depths exceed the height of the cab or across flat ground. Disposal shall always be to the outside or downhill side of the road.

Outlets - Outlets for surface runoff shall be placed in all snow through cuts at points where water can flow off the road surface at the following intervals:

8% or less grades - 500 feet center to center minimum.

8% and up grades - 300 feet center to center minimum.

Snow Floor - a four- to six-inch snow floor shall be left on the road bed to prevent removal of road bed surfacing.

Cattleguards - Crawler tractors will not be operated across cattleguards.

Culvert Cleaning - Culvert heads and outlets shall be cleaned of snow pack by hand.

Tree Damage - Snow should not be pushed, blown, or stacked on trees along the roadside. Care will be taken to avoid scarring trees with equipment.

2. Travel

- a. The road may be used while the snow floor remains intact or under frozen conditions.
- b. All travel must cease when temperatures allow the road to thaw and rutting of the road surface is occurring.
- c. This closure will be in effect until the surface dries or refreezes.

3. Inspections

- a. An equipment inspection may be made prior to the starting of operations.
- b. A first day of operation inspection will be made to insure compliance.
- c. Intermittent inspections may be made during snow removal operations.
- d. Final inspection will be made to check for full compliance and damages.

Bond Determination
 Genwal Coal Company - Road Use Permit
 CRANDALL CANYON ROAD

Total bond will be in an amount equal to the construction cost of the bridge and an amount which the Forest Service feels would be required to reestablish the road area if the operator, for some unforeseen reason, began operations and then abandoned the project.

The total length of the project is 1.5 miles \pm . If this area were completely torn up and abandoned, I feel we could reestablish the road with our loader, dozer, and truck crew in 20 working days and our motor patrol crew for 3 days. In the worst case, all the drainage would be disturbed and would have to be replaced. From the road plans, there are 10 20-inch culverts to be installed, 1 30-inch culvert, 1 48-inch culvert, and 1 9'6"x6'5" culvert with headwalls. These culverts would constitute all the materials which we would have to supply, along with equipment and manpower to reestablish the road.

1. The cost for reestablishing the road is itemized as follows:

Manpower:

Engineer	20 days @ \$118.60	= \$ 2,372.00
3 Laborers	20 days @ 70.80 x 3	= 4,248.00
3 Operators	20 days @ 173.00 x 3	= 10,380.00
1 Laborer	3 days @ 70.80	= 212.40
1 Operator	3 days @ 173.00	= <u>519.00</u>
Subtotal		\$17,731.40

Equipment: (Based on Region 4 Cost Engineering Guide)

Dozer	150 hours @ \$ 45.00	= \$ 6,750.00
Loader	150 hours @ 40.00	= 6,000.00
Pickup	20 days @ 52.00	= 1,040.00
Fuel Truck	20 days @ 150.00	= 3,000.00
Roller	150 hours @ 61.60	= 9,240.00
2 End Dumps	50 hrs. ea. @ 50.30	= 5,030.00
6-Pack Crew Rig	20 days @ 80.00	= 1,600.00
Motor Patrol	30 days @ 55.00	= <u>1,650.00</u>
Subtotal		\$34,310.00

Materials:

10 - 24" x 40' cmp = 400 feet	@ \$ 9.43	= \$ 3,772.00
1 - 30" x 40' cmp = 40 feet	@ 11.50	= 460.00
1 - 48" x 40' cmp = 40 feet	@ 18.40	= 736.00
1 - 9'6" x 6'5" x 65' = 65 feet	@ 90.00	= 5,850.00
2 - Headwalls w/slope paving	= 13 yards @ 250.00	= <u>3,250.00</u>
Subtotal		\$14,068.00

Seeding and Mulching:

9 acres @ \$400/acre		\$ 3,600.00
2. Cost of double-lane bridge, includes all labor, supervision, materials, necessary bonds, and miscellaneous. (Permittee's estimate)		\$95,452.00
Rounded		\$95,000.00

3. Summary:

1. Road reestablishment:

Manpower	= \$17,731.40
Equipment	= 34,310.00
Materials	= 14,068.00
Seeding and Mulching	= 3,600.00

2. Bridge = \$95,000.00

TOTAL \$165,009.40

Rounded for Bonding

\$165,000.00

LIST OF APPENDICES (continued)

Appendix

- 3-16. Irrigation Plan
- 3-17. Coal Silo Calculations
- 3-18. Contract Document & Specifications for Haul Road Improvement Project
- 3-19. Storage Pad Stability Analysis
- 3-20. Road Expansion (within permit area) Safety Factor, Drawings

LIST OF PLATES

Plate

- 3-1. Proposed Surface Facilities
- 3-2. Mining Plan Hiawatha Seam, Map 101
- 3-3. Hiawatha Mine Plan
- 3-4. Phase 1 Reclamation
- 3-5. Phase 2 Reclamation
- 3-5A. Crandall Canyon Mine Cross Sections
- 3-6. Plan & Profile Haul Road
- 3-7. Proposed in Mine Sumps
- 3-8. Topsoil Stockpiles
- 3-9. Old Hiawatha Workings
- 3-10. Topsoil Location Map
- 3-11. Coal Loading Facility
- 3-12. Rock Dust Silo
- 3-13. Electrical Substation Installation (Switchgear House)
- 3-14. Proposed Bath House
- 3-15. Road Expansion Improvement Project
- 3-16. As-built Surface Improvement Project

area. All water from the pad area construction will be treated in the newly renovated sediment pond.

During the renovation of the sediment pond, if necessary, water entering the pond will be pumped into the mine sump and discharged to Crandall Creek after treatment.

3.2.10 Transportation, Roads, Parking Areas. The coal from the mine will be transported to the rail loadout or final destination by truck. The trucks are typical 45 ton tandem trailer coal haulers used in the Utah coal fields. Genwal Coal presently leases a loading site on the Utah Railway located at Mohrland, Utah, and owns a loading facility on the Denver Rio Grande in Wellington, Utah.

The Forest Development Road from Huntington Creek to the truck turn around area will be designated as a Class One road and will be maintained in compliance with the road use permit issued by the U.S. Forest Service, Manti-LaSal National Forest. The forest access road will remain as part of the post mining land use in accordance with the Forest Service Permit (see Appendix 2-3). The Class Two Forest Service Access Road to the main pad area from the truck turn around area will be designed, maintained and restored in accordance with the Forest Service road use permit. The Class Two Road from the main pad area to the portal area will be designed (as shown on Plate 3-6), maintained and restored in accordance with UMC 817.160-170. The Class Three Road to the upper pad will be designed (as shown on Plate 3-6), maintained and restored in accordance with UMC 817.170-176.

The Forest Development Road has been designed and approved by the USFS prior to construction. The design drawings are on file with the Manti-LaSal National Forest in Price, Utah. During the 1991 construction season Genwal Coal Company will improve and asphalt the Forest Service Development road and surface facilities area of the Crandall Canyon Mine (as shown on Plate 3-15). The improvement information covering the haul road and facilities area is addressed in Appendicies 3-18, 3-19, and 3-20. As-built drawings of surface facilities will be shown on plate 3-16.

Appendix 3-18

Contract Document & Specifications for Haul
Road Improvement Project

CONTRACT DOCUMENTS &
SPECIFICATIONS FOR

GENWALL COAL CO.
CRANDALL CANYON MINE
ROAD IMPROVEMENT PROJECT

MAY 1991

TABLE OF CONTENTS

Bidder Documents and
Agreements.....Documents 1 thru 10

Standard General Agreements.....pages 1 thru 27

Special Conditions.....pages 1 thru 6

Construction Specifications:

No. 8 Mobilization.....pages 8-1 thru 8-2

No. 10 Bituminous Surface Course...pages 10-1 thru 10-10

No. 21 Excavation.....pages 21-1 thru 21-6

No. 23 Earth Fill.....pages 23-1 thru 23-8

No. 32 Concrete for Minor Structures..pages 32-1 thru 32-6

No. 61 Loose Rock Rip Rap.....pages 61-1 thru 61-5

No. 62 Wire Basket Gabions.....pages 62-1 thru 62-4

No. 627 Flagging & Pilot Car Operation.pages 627-1thru627-2

Construction Drawings.....sheets 1 thru 8

ADVERTISEMENT FOR BIDS

Owner

Address

Separate sealed BIDS for the construction of (briefly describe nature, scope, and major elements of the work) _____

will be received by _____

at the office of _____

until _____, (Standard Time - Daylight Savings Time) _____,

19_____, and then at said office publicly opened and read aloud.

The CONTRACT DOCUMENTS may be examined at the following locations:

Copies of the CONTRACT DOCUMENTS may be obtained at the office of _____

_____ located at _____

upon payment of \$_____ for each set.

Any BIDDER, upon returning the CONTRACT DOCUMENTS promptly and in good condition, will be refunded his payment, and any non-bidder upon so returning the CONTRACT DOCUMENTS will be refunded \$_____.

Date

INFORMATION FOR BIDDERS

BIDS will be received by _____

(herein called the "OWNER"), at _____

until _____, 19____, and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to _____

at _____

Each sealed envelope containing a BID must be plainly marked on the outside as BID for _____ and the envelope should bear on the outside the name of the BIDDER, his address, his license number if applicable and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at _____

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within 60 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID Schedule by examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID bond payable to the OWNER for five percent of the total amount of the BID. As soon as the BID prices have been compared, the OWNER will return the BONDS of all except the three lowest responsible BIDDERS. When the Agreement is executed the bonds of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the payment BOND and performance BOND have been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A performance BOND and a payment BOND, each in the amount of 100 percent of the CONTRACT PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign BID BONDS or payment BONDS and performance BONDS must file with each BOND a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the performance BOND and payment BOND within ten (10) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary Agreement and BOND forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may at his option consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within ten (10) days of receipt of acceptable performance BOND, payment BOND and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by WRITTEN NOTICE withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the lowest responsible BIDDER.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to his BID.

Further, the BIDDER agrees to abide by the requirements under Executive Order No. 11246, as amended, including specifically the provisions of the equal opportunity clause set forth in the SUPPLEMENTAL GENERAL CONDITIONS.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER.

Inspection trips for prospective BIDDERS will leave from the office of the

_____ at _____

The ENGINEER is _____ His address

is _____

BID

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as _____*

To the _____ (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of _____

in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to his own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within _____ consecutive calendar days thereafter. BIDDER further agrees to pay as liquidated damages, the sum of \$_____ for each consecutive calendar day thereafter as provided in Section 15 of the General Conditions.

BIDDER acknowledges receipt of the following ADDENDUM:

*Insert "a corporation", "a partnership", or "an individual" as applicable.

BIDDER AGREES TO PERFORM ALL THE WORK DESCRIBED IN THE CONTRACT DOCUMENTS FOR THE FOLLOWING UNIT PRICE OR LUMP SUM:

GENWAL COAL COMPANY
MINE HAUL ROAD

BID SCHEDULE

ITEM SPEC#	WORK OR MATERIAL	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1.	MOBILIZATION	L.S.	1	\$	
2.	ROADWAY EXCAVATION	CU.YD	1600	\$	
3.	BITUMINOUS SURFACE COURSE 3/4 IN. MAX WITH GRADE AC-10 VISCOSITY GRADED ASPHALT	TON	5200	\$	
4.	BITUMINOUS MATERIAL GRADE LM-CRS-2H	TON	45	\$	
5.	COVER MATERIAL TYPE A	TON	275	\$	
6.	FLAGGING	HOURS	500	\$	
7.	GRANULAR BORROW	CU.YD	2200	\$	
8.	ROCK GABIONS & WIRE FABRIC	CU.YD	550	\$	
9.	CONCRETE PAVEMENT	CU.YD.	65	\$	
10.	DITCH RIP-RAP	CU. YD.	150	\$	
11.	UNTREATED BASE COURSE 1-INCH MAX.	CU.YD	900	\$	
12.	HILFIKER WELDED WIRE WALL	L.S.	1	\$	
13.	LOOSE ROCKWALL	CU.YD.	750	\$	
14.	BITUMINOUS MATERIAL SS-1H	TON	8	\$	

TOTAL BID.....\$

WHERE EXTENSION ERRORS OCCUR, THE UNIT PRICES SHALL BE USED TO DETERMINE THE AMOUNT.

SIGNATURE

ADDRESS

TITLE

DATE

LICENSE NUMBER

ATTEST

SEAL

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
_____ as Principal, and
_____ as Surety, are hereby
held and firmly bound unto _____ as OWNER
in the penal sum of _____
for the payment of which, well and truly to be made, we hereby jointly and severally
bind ourselves, successors and assigns.

Signed, this _____ day of _____, 19 _____.

The Condition of the above obligation is such that whereas the Principal has submitted
to _____ a certain BID,
attached hereto and hereby made a part hereof to enter into a contract in writing, for the

NOW, THEREFORE,

- (a) If said BID shall be rejected, or
- (b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID.

then this obligation shall be void, otherwise the same shall remain in force and effect;
it being expressly understood and agreed that the liability of the Surety for any and
all claims hereunder shall, in no event, exceed the penal amount of this obligation as
herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal (L.S.)

Surety

By: _____

IMPORTANT—Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 19_____, by
and between _____,
(Name of Owner), (an Individual) hereinafter called "OWNER"

and _____ doing business as (an individual,) or (a
partnership,) or (a corporation) hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements herein-
after mentioned:

1. The CONTRACTOR will commence and complete the construction of

2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment,
labor and other services necessary for the construction and completion of the PROJECT
described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOC-
UMENTS within _____ calendar days after the date of the NOTICE TO PRO-
CEED and will complete the same within _____ calendar days unless the period
for completion is extended otherwise by the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CON-
TRACT DOCUMENTS and comply with the terms therein for the sum of \$ _____,
or as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

- (A) Advertisement For BIDS
- (B) Information For BIDDERS
- (C) BID
- (D) BID BOND
- (E) Agreement

(F) General Conditions

(G) SUPPLEMENTAL GENERAL CONDITIONS

(H) Payment BOND

(I) Performance BOND

(J) NOTICE OF AWARD

(K) NOTICE TO PROCEED

(L) CHANGE ORDER

(M) DRAWINGS prepared by _____
numbered _____ through _____, and dated _____,
19 _____

(N) SPECIFICATIONS prepared or issued by _____

dated _____, 19 _____

(O) ADDENDA:

No. _____, dated _____, 19 _____

6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT DOCUMENTS.

7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in (_____) each of which shall be deemed an original on the date first above written.
(Number of Copies)

OWNER:

BY _____

Name _____
(Please Type)

Title _____

(SEAL)

ATTEST:

Name _____
(Please Type)

Title _____

CONTRACTOR:

BY _____

Name _____
(Please Type)

Address _____

(SEAL)

ATTEST:

Name _____
(Please Type)

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____ (Name of Contractor)

_____ (Address of Contractor)

a _____, hereinafter called Principal,
(Corporation, Partnership or Individual)

and _____ (Name of Surety)

_____ (Address of Surety)

hereinafter called Surety, are held and firmly bound unto _____

_____ (Name of Owner)

_____ (Address of Owner)

hereinafter called OWNER, in the penal sum of _____ Dollars, \$(_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____ 19_____, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each
(number)
one of which shall be deemed an original, this the _____ day of _____
19 _____.

ATTEST:

Principal

(Principal) Secretary

(SEAL)

By _____ (s)

(Address)

Witness as to Principal

(Address)

ATTEST:

Surety

By _____
Attorney-in-Fact

Witness as to Surety

(Address)

(Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called Principal, and
(Corporation, Partnership, or Individual)

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto _____

(Name of owner)

(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

_____ Dollars, \$(_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 19____, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each
(Number)
one of which shall be deemed an original, this the _____ day of _____
19_____.

ATTEST:

(Principal) Secretary

(SEAL)

(Witness as to Principal)

(Address)

Principal
By _____ (s)

(Address)

Surety

ATTEST:

(Surety) Secretary

(SEAL)

Witness as to Surety

(Address)

By _____
Attorney-in-Fact

(Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

NOTICE OF AWARD

To: _____

PROJECT Description: _____

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, 19 _____, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 19_____.

Owner
By _____
Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

by _____

this the _____ day of _____, 19_____

By _____

Title _____

NOTICE TO PROCEED

To: _____

Date: _____
Project: _____

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 19_____, on or before _____, 19_____, and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 19_____.

Owner
By _____
Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____

this the _____ day
of _____, 19_____

By _____
Title _____

CHANGE ORDER

Order No. _____

Date: _____

Agreement Date: _____

NAME OF PROJECT: _____

OWNER: _____

CONTRACTOR: _____

The following changes are hereby made to the CONTRACT DOCUMENTS:

Justification:

Change to CONTRACT PRICE:

Original CONTRACT PRICE \$ _____

Current CONTRACT PRICE adjusted by previous CHANGE ORDER \$ _____

The CONTRACT PRICE due to this CHANGE ORDER will be (increased) (decreased) by: \$ _____

The new CONTRACT PRICE including this CHANGE ORDER will be \$ _____

Change to CONTRACT TIME:

The CONTRACT TIME will be (increased) (decreased) by _____ calendar days.

The date for completion of all work will be _____ (Date).

Approvals Required:

To be effective this Order must be approved by the Federal agency if it changes the scope or objective of the PROJECT, or as may otherwise be required by the SUPPLEMENTAL GENERAL CONDITIONS.

Requested by: _____

Recommended by: _____

Ordered by: _____

Accepted by: _____

Federal Agency Approval (where applicable) _____

This document has important legal consequences; consultation with an attorney is encouraged with respect to its completion or modification.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT



Jointly Issued by

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE

A practice division of the

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

and by

AMERICAN CONSULTING ENGINEERS COUNCIL

and by

CONSTRUCTION SPECIFICATIONS INSTITUTE

© 1978 National Society of Professional Engineers
2029 K Street, N.W., Washington, D.C. 20006

American Consulting Engineers Council
1015 15th Street, N.W., Washington, D.C. 20005

Construction Specifications Institute
1150 17th Street, N.W., Washington, D.C. 20036

These General Conditions have been prepared for use with the Owner-Contractor Agreements (NSPE-ACEC Document 1910-8-A-1 or 1910-8-A-2; CSI 56467, 56468, 1978 editions). Their provisions are interrelated and a change in one may necessitate a change in the others. Comments concerning their usage are contained in the Commentary to the Documents, NSPE-ACEC 1910-9, 1978 edition.

TABLE OF CONTENTS OF GENERAL CONDITIONS

<i>Article Number</i>	<i>Title</i>	<i>Page</i>
1	DEFINITIONS.....	8
2	PRELIMINARY MATTERS.....	9
3	CONTRACT DOCUMENTS: INTENT AND REUSE.....	10
4	AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS.....	10
5	BONDS AND INSURANCE.....	11
6	CONTRACTOR'S RESPONSIBILITIES.....	12
7	WORK BY OTHERS.....	16
8	OWNER'S RESPONSIBILITIES.....	17
9	ENGINEER'S STATUS DURING CONSTRUCTION.....	17
10	CHANGES IN THE WORK.....	18
11	CHANGE OF CONTRACT PRICE.....	18
12	CHANGE OF THE CONTRACT TIME.....	21
13	WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.....	21
14	PAYMENTS TO CONTRACTOR AND COMPLETION.....	22
15	SUSPENSION OF WORK AND TERMINATION.....	25
16	ARBITRATION.....	26
17	MISCELLANEOUS.....	27

INDEX TO GENERAL CONDITIONS

	<i>Article or Paragraph Number</i>
Acceptance of Insurance	5.13
Access to the Work	13.2
Addenda—definition of (see definition of Specifications)	1
Agreement—definition of	1
All Risk Insurance	5.6
Application for Payment—definition of	1
Application for Payment, Final	14.12
Application for Progress Payment	14.2
Application for Progress Payment—review of	14.4 thru 14.7
Arbitration	16
Availability of Lands	4.1
Award—Notice of—defined	1
Before Starting Construction	2.5 thru 2.7
Bid—definition of	1
Bonds and Insurance—in general	5
Bonds—definition of	1
Bonds, Delivery of	2.1, 5.1
Bonds, Performance and Other	5.1, 5.2
Cash Allowances	11.10
Change Order—Definition of	1
Changes in the Work	10
Claims, Waiver of—on Final Payment	14.16
Clarifications and Interpretations	9.3
Cleaning	6.17
Completion	14
Completion, Substantial	14.8, 14.9
Conference—Pre-Construction	2.8
Construction Machinery, Equipment, etc.	6.4
Continuing Work	6.29
Contract Documents—definition of	1
Contract Documents—intent and reuse	3
Contract Documents—reuse of	3.5
Contract Price, Change of	11
Contract Price—definition	1
Contract Time, Change of	12
Contract Time—Commencement of	2.3
Contract Time—definition of	1
Contractor—definition of	1
Contractor May Stop Work or Terminate	15.5
Contractor's Continuing Obligation	14.15
Contractor's Duty to Report Discrepancy in Documents	2.5, 3.2
Contractor's Fee—Costs Plus	11.6
Contractor's Liability Insurance	5.3
Contractor's Responsibilities—in general	6
Contractor's Warranty of Title	14.3
Contractual Liability Insurance	5.4
Copies of Documents	2.2
Correction or Removal of Defective Work	13.11
Correction Period, One Year	13.12
Correction, Removal or Acceptance of Defective Work—in general	13.11 thru 13.14
Cost of Work	11.4, 11.5
Costs, Supplemental	11.4.5

Day—definition of	1
Defective Work, Acceptance of	13.13
Defective Work, Correction or Removal of	13.11
Defective—definition of	1
Defective Work—in general	13
Defective Work, Rejecting	9.4
Definitions	1
Delivery of Bonds	2.1
Disagreements, Decisions by Engineer	9.9, 9.10
Documents, Copies of	2.2
Documents, Record	6.19
Documents, Reuse	3.5
Drawings—definition of	1
Effective date of Agreement—definition of	1
Emergencies	6.22
Engineer—definition of	1
Engineer's—Notice Work is Acceptable	14.3
Engineer's Responsibilities, Limitations on	9.11 thru 9.14
Engineer's Status During Construction—in general	9
Engineer's—Recommendation of Payment	14.4, 14.13
Equipment, Labor, Materials and	6.3 thru 6.6
Equivalent Materials and Equipment	6.7
Fee, Contractor's—Costs Plus	11.6
Field Order—definition of	1
Field Order—issued by Engineer	10.2
Final Application for Payment	14.12
Final Inspection	14.11
Final Payment, Recommendation of	14.13, 14.14
Final Payment and Acceptance	14.13
General Requirements—definition of	1
General Provisions	17.3, 17.4
Giving Notice	17.1
Guarantee of Work—by Contractor	13.1
Indemnification	6.30 thru 6.32
Inspection, Final	14.11
Inspection, Tests and	13.3 thru 13.7
Insurance, Bonds and—in general	5
Insurance—Certificates of	2.7 and 5
Insurance, Contractor's Liability	5.3
Insurance, Contractual Liability	5.4
Insurance, Owner's Liability	5.5
Insurance, Property	5.6 thru 5.12
Intent of Contract Documents	3.1 thru 3.4, 9.12
Interpretations and Clarifications	9.3
Investigations of Physical Conditions	4.2
Labor, Materials and Equipment	6.3 thru 6.6
Laws and Regulations	6.14
Liability Insurance—Contractors	5.3
Liability Insurance—Owners	5.5
Limitations on Engineer's Responsibilities	9.11
Materials and Equipment—furnished by Contractor	6.3
Materials or Equipment—Equivalent	6.7
Miscellaneous Provisions	17
Modification—definition of	1

Notice, Giving of	17.1
Notice of Award—definition of	1
Notice of Acceptability of Project	14.13
Notice to Proceed—definition of	1
Notice to Proceed—giving of	2.3
“Or-Equal” items	6.7
Other Contractors	7
Overtime Work—prohibition of	6.3
Owner—definition of	1
Owner May Correct Defective Work	13.14
Owner May Stop Work	13.10
Owner May Suspend Work, Terminate	15.1 thru 15.4
Owner’s Duty to Execute Change Orders	11.8
Owner’s Liability Insurance	5.5
Owner’s Representative—Engineer to serve as	9.1
Owner’s Responsibilities—in general	8
Owner’s Separate Representative at Site	9.8
Partial Utilization	14.10
Partial Utilization—Property Insurance	5.14
Patent Fees and Royalties	6.12
Payments to Contractor—in general	14
Payments, Recommendation of	14.4 thru 14.7.5
Pre-construction Conference	2.8
Performance, and other Bonds	5.1 thru 5.2
Permits	6.13
Physical Conditions—Investigations and Reports	4.2
Physical Conditions, Unforeseen	4.3
Preconstruction Conference	2.8
Preliminary Matters	2
Premises, Use of	6.16, 6.17, 6.18
Price—Change of Contract	11
Price-Contract—definition of	1
Progress Payment, Applications for	14.2
Progress Schedule	2.6, 14.1
Project—definition of	1
Project Representative, Resident—definition of	1
Project Representation—Provision for	9.8
Project, Starting	2.4
Property Insurance	5.6 thru 5.12
Property Insurance—Receipt and Application of Proceeds	5.11, 5.12
Property Insurance—Partial Utilization	5.14
Protection, Safety and	6.20 thru 6.21
Recommendation of Payment	14.4, 14.13
Record Documents	6.19
Reference Points	4.4
Regulations, Laws and	6.14
Rejecting Defective Work	9.4
Remedies Not Exclusive	17.5
Removal or Correction of Defective Work	13.11
Resident Project Representative—definition of	1
Resident Project Representative—provision for	9.8
Responsibilities, Contractor’s	6
Responsibilities, Owner’s	8
Reuse of Documents	3.5
Royalties, Patent Fees and	6.13

Safety and Protection	6.20 thru 6.21
Samples	6.23
Schedule of Shop Drawing Submissions	2.6; 14.1
Schedule of Values	2.6, 14.1
Shop Drawings and Samples	6.23 thru 6.29
Shop Drawings—definition of	1
Site, Visits to—by Engineer	9.2
Specifications—definition of	1
Starting Construction, Before	2.5 thru 2.9
Starting the Project	2.4
Stopping Work—by Contractor	15.5
Stopping Work—by Owner	13.10
Subcontractor—definition of	1
Subcontractors—in general	6.8 thru 6.11
Substantial Completion—certification of	14.8
Substantial Completion—definition of	1
Subsurface Conditions	4.2, 4.3
Supplemental Costs	11.4.5
Surety—consent to payment	14.12, 14.14
Surety—notice of changes	10.5
Surety—qualification of	5.1, 5.2
Suspending Work, by Owner	15.1
Suspension of Work and Termination—in general	15
Superintendent—Contractor's	6.2
Supervision and Superintendence	6.1, 6.2
Taxes—Payment by Contractor	6.15
Termination—by Contractor	15.5
Termination—by Owner	15.2 thru 15.4
Termination, Suspension of Work and—in general	15
Tests and Inspections	13.3 thru 13.7
Time, Change of Contract	12
Time, Computation of	17.2
Time, Contract—definition of	1
Uncovering Work	13.8, 13.9
Unit Prices	11.3.1
Unit Prices—Adjustment of	11.9
Use of Premises	6.16, 6.17, 6.18
Values, Schedule of	14.1
Visits to Site—by Engineer	9.2
Waiver of Claims—on Final Payment	14.16
Waiver of Rights by Insured Parties	5.10
Warranty and Guarantee—by Contractor	13.1
Warranty of Title, Contractor's	14.3
Work, Access to	13.2
Work by Others—in general	7
Work, Cost of	11.4, 11.5
Work Continuing During Disputes	6.29
Work—definition of	1
Work, Neglected by Contractor	13.14
Work, Stopping by Contractor	15.5
Work, Stopping by Owner	15.1 thru 15.4

GENERAL CONDITIONS

ARTICLE I—DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

Addenda—Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents.

Agreement—The written agreement between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment—The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payment and which is to include such supporting documentation as is required by the Contract Documents.

Bid—The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bonds—Bid, performance and payment bonds and other instruments of security.

Change Order—A written order to CONTRACTOR signed by OWNER authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time issued after the effective date of the Agreement.

Contract Documents—The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications, the Drawings as the same are more specifically identified in the Agreement, together with all Modifications issued after the execution of the Agreement.

Contract Price—The moneys payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement.

Contract Time—The number of days (computed as provided in paragraph 17.2) or the date stated in the Agreement for the completion of the Work.

CONTRACTOR—The person, firm or corporation with whom OWNER has entered into the Agreement.

day—A calendar day of twenty-four hours measured from midnight to the next midnight.

defective—An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment.

Drawings—The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

effective date of the Agreement—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

ENGINEER—The person, firm or corporation named as such in the Agreement.

Field Order—A written order issued by ENGINEER which orders minor changes in the Work in accordance with paragraph 10.2 but which does not involve a change in the Contract Price or the Contract Time.

General Requirements—Sections of Division 1 of the Specifications.

Modification—(a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) a Field Order. A modification may only be issued after the effective date of the Agreement.

Notice of Award—The written notice by OWNER to the apparent successful Bidder stating that upon compliance by the apparent successful Bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

Notice to Proceed—A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform his obligation under the Contract Documents.

OWNER—The public body or authority, corporation, association, partnership, or individual with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

Project—The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Resident Project Representative—The authorized representative of ENGINEER who is assigned to the site or any part thereof.

Shop Drawings—All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by CONTRACTOR, a Subcontractor, manufacturer, fabricator, supplier or distributor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a manufacturer, fabricator, supplier or distributor and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.

Specifications—Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor—An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

Substantial Completion—The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by his definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it was intended; or if there be no such certificate issued, when final payment is due in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Work—The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

ARTICLE 2—PRELIMINARY MATTERS

Delivery of Bonds:

2.1. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

Copies of Documents:

2.2. OWNER shall furnish to CONTRACTOR up to ten copies (unless otherwise specified in the General Requirements) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

Commencement of Contract Time; Notice to Proceed:

2.3. The Contract Time will commence to run on the thirtieth day after the effective date of the Agreement, or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed; but in no event shall the Contract Time commence to run later than the ninetieth day after the day of Bid opening or the thirtieth day after the effective date of the Agreement. A Notice to Proceed may be given at any time within thirty days after the effective date of the Agreement.

Starting the Project:

2.4. CONTRACTOR shall start to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.

Before Starting Construction:

2.5. Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error or discrepancy which CONTRACTOR may discover; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Drawings or Specifications, unless CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

2.6. Within ten days after the effective date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review and acceptance an estimated progress schedule indicating the starting and completion dates of the various stages of the Work, a preliminary schedule of Shop Drawing submissions, and a preliminary schedule of values of the Work.

2.7. Before any Work at the site is started, CONTRACTOR shall deliver to OWNER, with a copy to ENGINEER, certificates (and other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.3 and 5.4, and OWNER shall deliver to CONTRACTOR certificates (and other evidence of insurance requested by CONTRACTOR) which OWNER is required to purchase and maintain in accordance with paragraphs 5.6 and 5.7.

Preconstruction Conference:

2.8. Within twenty days after the effective date of the Agreement, but before CONTRACTOR starts the Work at the site, a conference will be held for review and acceptance of the schedules referred to in paragraph 2.6, to establish procedures for handling Shop Drawings and other submittals and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT AND REUSE

Intent:

3.1. The Contract Documents comprise the entire Agreement between OWNER and CONTRACTOR concerning the Work. They may be altered only by a Modification.

3.2. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, he shall report it to ENGINEER in writing at once and before proceeding with the Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Specifications or Drawings unless CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

3.3. It is the intent of the Specifications and Drawings to describe a complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials or equipment such words shall be interpreted in accordance with such meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the code of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual or code in effect at the time of opening of Bids (or, on the effective date of the Agreement if there were no Bids), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their agents or employees from those set forth in the Contract Documents. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided for in paragraph 9.3.

3.4. The Contract Documents will be governed by the law of the place of the Project.

Reuse of Documents:

3.5. Neither CONTRACTOR nor any Subcontractor, manufacturer, fabricator, supplier or distributor shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER; and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

ARTICLE 4—AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

Availability of Lands:

4.1. OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way for access thereto, and such other lands which are designated for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR believes that any delay in OWNER's furnishing these lands or easements entitles him to an extension of the Contract Time, CONTRACTOR may make a claim therefor as provided in Article 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

Physical Conditions—Investigations and Reports:

4.2. Reference is made to the Supplementary Conditions for identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which have been relied upon by ENGINEER in preparation of the Drawings and Specifications. Such reports are not guaranteed as to accuracy or completeness and are not part of the Contract Documents.

Unforeseen Physical Conditions:

4.3. CONTRACTOR shall promptly notify OWNER and ENGINEER in writing of any subsurface or latent physical conditions at the site or in an existing structure differing materially from those indicated or referred to in the Contract Documents. ENGINEER will promptly review those conditions and advise OWNER in writing if further investigation or tests are necessary. Promptly thereafter, OWNER shall obtain the necessary additional investigations and tests and furnish copies to ENGINEER and CONTRACTOR. If ENGINEER finds that the results of such investigations or tests indicate that there are subsurface or latent physical conditions which differ materially from those intended in the Contract Documents, and which could not reasonably have been anticipated by CONTRACTOR, a Change Order shall be issued incorporating the necessary revisions.

Reference Points:

4.4. OWNER shall provide engineering surveys for construction to establish reference points which in his judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specified in the General Requirements), shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for replace-

ment or relocation of such reference points by professionally qualified personnel.

ARTICLE 5—BONDS AND INSURANCE

Performance and Other Bonds:

5.1. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date of final payment, except as otherwise provided by law. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the forms prescribed by the bidding documents or Supplementary Conditions and be executed by such Sureties as (i) are licensed to conduct business in the state where the Project is located, and (ii) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

5.2. If the Surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of clauses (i) and (ii) of paragraph 5.1, CONTRACTOR shall within five days thereafter substitute another Bond and Surety, both of which shall be acceptable to OWNER.

Contractor's Liability Insurance:

5.3. CONTRACTOR shall purchase and maintain such comprehensive general liability and other insurance as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether such performance is by CONTRACTOR, by any Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

5.3.1. Claims under workers' or workmen's compensation, disability benefits and other similar employee benefit acts;

5.3.2. Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

5.3.3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

5.3.4. Claims for damages insured by personal injury liability coverage which are sustained (i) by any person as a

result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;

5.3.5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and

5.3.6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The insurance required by this paragraph 5.3 shall include the specific coverages and be written for not less than the limits of liability and coverages provided in the Supplementary Conditions, or required by law, whichever is greater. The comprehensive general liability insurance shall include completed operations insurance. All such insurance shall contain a provision that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and ENGINEER. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with paragraph 13.12. In addition, CONTRACTOR shall maintain such completed operations insurance for at least two years after final payment and furnish OWNER with evidence of continuation of such insurance at final payment and one year thereafter.

Contractual Liability Insurance:

5.4. The comprehensive general liability insurance required by paragraph 5.3 will include contractual liability insurance applicable to CONTRACTOR's obligations under paragraphs 6.30 and 6.31.

Owner's Liability Insurance:

5.5. OWNER shall be responsible for purchasing and maintaining his own liability insurance and, at his option, may purchase and maintain such insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

Property Insurance:

5.6. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by law). This insurance shall include the interests of OWNER, CONTRACTOR and Subcontractors in the Work, shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including fees and charges of engineers,

architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The policies of insurance required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 shall contain a provision that the coverage afforded will not be cancelled or materially changed until at least thirty days' prior written notice has been given to CONTRACTOR.

5.7. OWNER shall purchase and maintain such boiler and machinery insurance as may be required by the Supplementary Conditions or by law. This insurance shall include the interests of OWNER, CONTRACTOR and Subcontractors in the Work.

5.8. OWNER shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR or Subcontractors in the Work to the extent of any deductible amounts that are provided in the Supplementary Conditions. If CONTRACTOR wishes property insurance coverage within the limits of such amounts, CONTRACTOR may purchase and maintain it at his own expense.

5.9. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policy, OWNER shall, if possible, include such insurance, and the cost thereof shall be charged to CONTRACTOR by appropriate Change Order. Prior to commencement of the Work at the site, OWNER will in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

Waiver of Rights:

5.10. OWNER and CONTRACTOR waive all rights against each other and the Subcontractors and their agents and employees and against ENGINEER and separate contractors (if any) and their subcontractors' agents and employees, for damages caused by fire or other perils to the extent covered by insurance provided under paragraphs 5.6 and 5.7, inclusive, or any other property insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance held by OWNER as trustee. OWNER shall require similar written waivers by ENGINEER and from each separate contractor, and CONTRACTOR shall require similar written waivers from each Subcontractor (in accordance with paragraph 6.11 as applicable); each such waiver will be in favor of all other parties enumerated in this paragraph 5.10.

Receipt and Application of Proceeds:

5.11. Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 shall be adjusted with OWNER and made payable to OWNER as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.12. OWNER shall deposit in a separate account any

money so received, and he shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order.

5.12. OWNER as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as trustee shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If required in writing by any party in interest, OWNER as trustee shall upon the occurrence of an insured loss, give bond for the proper performance of his duties.

Acceptance of Insurance:

5.13. If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.3 and 5.4 on the basis of its not complying with the Contract Documents, OWNER will notify CONTRACTOR in writing thereof within ten days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.7. If CONTRACTOR has any objection to the coverage afforded by or other provisions of the policies of insurance required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 on the basis of their not complying with the Contract Documents, CONTRACTOR will notify OWNER in writing thereof within ten days of the date of delivery of such certificates to CONTRACTOR in accordance with paragraph 2.7. OWNER and CONTRACTOR will each provide to the other such additional information in respect of insurance provided by him as the other may reasonably request. Failure by OWNER or CONTRACTOR to give any such notice of objection within the time provided shall constitute acceptance of such insurance purchased by the other as complying with the Contract Documents.

Partial Utilization—Property Insurance:

5.14. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be cancelled or lapse on account of any such partial use or occupancy.

ARTICLE 6—CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1. CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto

and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be responsible to see that the finished Work complies accurately with the Contract Documents.

6.2. CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials and Equipment:

6.3. CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Supplementary Conditions, all Work at the site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's written consent given after prior written notice to ENGINEER.

6.4. CONTRACTOR shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the Work.

6.5. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment.

6.6. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, supplier or distributor, except as otherwise provided in the Contract Documents.

Equivalent Materials and Equipment:

6.7. Whenever materials or equipment are specified or described in the Drawings or Specifications by using the name of a proprietary item or the name of a particular manufacturer,

fabricator, supplier or distributor, the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other manufacturers, fabricators, suppliers or distributors may be accepted by ENGINEER if sufficient information is submitted by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is equivalent to that named. The procedure for review by ENGINEER will be as set forth in paragraphs 6.7.1 and 6.7.2 below as supplemented in the General Requirements.

6.7.1. Requests for review of substitute items of material and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment CONTRACTOR shall make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified. The application will state whether or not acceptance of the substitute for use in the Work will require a change in the Drawings or Specifications to adapt the design to the substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified shall be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish at CONTRACTOR's expense additional data about the proposed substitute. ENGINEER will be the sole judge of acceptability, and no substitute will be ordered or installed without ENGINEER's prior written acceptance. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

6.7.2. ENGINEER will record time required by ENGINEER and ENGINEER's consultants in evaluating substitutions proposed by CONTRACTOR and in making changes in the Drawings or Specifications occasioned thereby. Whether or not ENGINEER accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's consultants for evaluating any proposed substitute.

Concerning Subcontractors:

6.8. CONTRACTOR shall not employ any Subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment),

whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. A Subcontractor or other person or organization identified in writing to OWNER and ENGINEER by CONTRACTOR prior to the Notice of Award and not objected to in writing by OWNER or ENGINEER prior to the Notice of Award will be deemed acceptable to OWNER and ENGINEER. Acceptance of any Subcontractor, other person or organization by OWNER or ENGINEER shall not constitute a waiver of any right of OWNER or ENGINEER to reject defective Work. If OWNER or ENGINEER after due investigation has reasonable objection to any Subcontractor, other person or organization proposed by CONTRACTOR after the Notice of Award, CONTRACTOR shall submit an acceptable substitute and the Contract Price shall be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate Change Order shall be issued. CONTRACTOR shall not be required to employ any Subcontractor, other person or organization against whom CONTRACTOR has reasonable objection.

6.9. CONTRACTOR shall be fully responsible for all acts and omissions of his Subcontractors and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that CONTRACTOR is responsible for the acts and omissions of persons directly employed by CONTRACTOR. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER and any Subcontractor or other person or organization having a direct contact with CONTRACTOR, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any Subcontractor or other person or organization, except as may otherwise be required by law. OWNER or ENGINEER may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of amounts paid to CONTRACTOR on account of specific Work done.

6.10. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or delineating the Work to be performed by any specific trade.

6.11. All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER and contains waiver provisions as required by paragraph 5.10. CONTRACTOR shall pay each Subcontractor a just share of any insurance moneys received by CONTRACTOR on account of losses under policies issued pursuant to paragraphs 5.6 through 5.8.

Patent Fees and Royalties:

6.12. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any inven-

tion, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including attorneys' fees) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

Permits:

6.13. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids. CONTRACTOR shall pay all charges of utility service companies for connections to the Work, and OWNER shall pay all charges of such companies for capital costs related thereto.

Laws and Regulations:

6.14. CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the Work. If CONTRACTOR observes that the Specifications or Drawings are at variance therewith, CONTRACTOR shall give ENGINEER prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate Modification. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such laws, ordinances, rules and regulations, and without such notice to ENGINEER, CONTRACTOR shall bear all costs arising therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules and regulations.

Taxes:

6.15. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by him in accordance with the law of the place of the Project.

Use of Premises:

6.16. CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workmen to areas permitted by law, ordinances, permits or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.

6.17. During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

6.18. CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

Record Documents:

6.19. CONTRACTOR shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, Shop Drawings and samples at the site, in good order and annotated to show all changes made during the construction process. These shall be available to ENGINEER for examination and shall be delivered to ENGINEER for OWNER upon completion of the Work.

Safety and Protection:

6.20. CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1. all employees on the Work and other persons who may be affected thereby,

6.20.2. all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and

6.20.3. other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

CONTRACTOR shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the Work may affect them. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attribut-

able to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR). CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable.

6.21. CONTRACTOR shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to OWNER.

Emergencies:

6.22. In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from ENGINEER or OWNER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby.

Shop Drawings and Samples:

6.23. After checking and verifying all field measurements, CONTRACTOR shall submit to ENGINEER for review and approval, in accordance with the accepted schedule of Shop Drawing submissions (see paragraph 2.8), five copies (unless otherwise specified in the General Requirements) of all Shop Drawings, which shall have been checked by and stamped with the approval of CONTRACTOR and identified as ENGINEER may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and like information to enable ENGINEER to review the information as required.

6.24. CONTRACTOR shall also submit to ENGINEER for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of CONTRACTOR, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

6.25. At the time of each submission, CONTRACTOR shall in writing call ENGINEER's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.

6.26. ENGINEER will review and approve with reasonable promptness Shop Drawings and samples, but ENGINEER's review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, sequences, techniques or pro-

cedures of construction or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make any corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and resubmit new samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals. CONTRACTOR's stamp of approval on any Shop Drawing or sample shall constitute a representation to OWNER and ENGINEER that CONTRACTOR has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that CONTRACTOR has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contract Documents.

6.27. Where a Shop Drawing or sample is required by the Specifications, no related Work shall be commenced until the submittal has been reviewed and approved by ENGINEER.

6.28. ENGINEER's review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any deviations from the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to such deviation at the time of submission and ENGINEER has given written concurrence and approval to the specific deviation, nor shall any concurrence or approval by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings.

Continuing the Work:

6.29. CONTRACTOR shall carry on the Work and maintain the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as CONTRACTOR and OWNER may otherwise agree in writing.

Indemnification:

6.30. To the fullest extent permitted by law, CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER and their agents and employees from and against all claims, damages, losses and expenses including but not limited to attorneys' fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

6.31. In any and all claims against OWNER or ENGINEER or any of their agents or employees by any employee of

CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.30 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

6.32. The obligations of CONTRACTOR under paragraph 6.30 shall not extend to the liability of ENGINEER, his agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications.

ARTICLE 7—WORK BY OTHERS

7.1. OWNER may perform additional work related to the Project by himself, or have additional work performed by utility service companies, or let other direct contracts therefor which shall contain General Conditions similar to these. CONTRACTOR shall afford the utility service companies and the other contractors who are parties to such direct contracts (or OWNER, if OWNER is performing the additional work with OWNER's employees) reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate his Work with theirs.

7.2. If any part of CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor or utility service company (or OWNER), CONTRACTOR shall inspect and promptly report to ENGINEER in writing any patent or apparent defects or deficiencies in such work that render it unsuitable for such proper execution and results. CONTRACTOR's failure so to report shall constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or non-apparent defects and deficiencies in the other work.

7.3. CONTRACTOR shall do all cutting, fitting and patching of his Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected.

7.4. If the performance of additional work by other contractors or utility service companies or OWNER was not noted in the Contract Documents, written notice thereof shall be given to CONTRACTOR prior to starting any such additional work. If CONTRACTOR believes that the performance of such additional work by OWNER or others involves additional expense to CONTRACTOR or requires an extension of the Contract Time, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

ARTICLE 8—OWNER'S RESPONSIBILITIES

8.1. OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER. Any dispute in connection with such appointment shall be subject to arbitration.

8.3. OWNER shall furnish the data required of OWNER under the Contract Documents promptly and shall make payments to CONTRACTOR promptly after they are due as provided in paragraphs 14.4 and 14.13.

8.4. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4 Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting performance of the Work which have been relied upon by ENGINEER in preparing the Drawings and Specifications.

8.5. OWNER's responsibilities in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.7.

8.6. In connection with OWNER's rights to request changes in the Work in accordance with Article 10, OWNER (especially in certain instances as provided in paragraph 10.4) is obligated to execute Change Orders.

8.7. OWNER's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8. In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

ARTICLE 9—ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative:

9.1. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site:

9.2. ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the

progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations as an experienced and qualified design professional, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defects and deficiencies in the Work.

Clarifications and Interpretations:

9.3. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If CONTRACTOR believes that a written clarification or interpretation justifies an increase in the Contract Price or Contract Time, CONTRACTOR may make a claim therefor as provided in Article 11 or Article 12.

Rejecting Defective Work:

9.4. ENGINEER will have authority to disapprove or reject Work which is defective, and will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.5. In connection with ENGINEER's responsibility for Shop Drawings and samples, see paragraphs 6.23 through 6.29 inclusive.

9.6. In connection with ENGINEER's responsibilities as to Change Orders, see Articles 10, 11 and 12.

9.7. In connection with ENGINEER's responsibilities in respect of Applications for Payment, etc., see Article 14.

Project Representation:

9.8. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in observing the performance of the Work. The duties, responsibilities and limitations of authority of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions. If OWNER designates another agent to represent him at the site who is not ENGINEER's agent or employee, the duties, responsibilities and limitations of authority of such other person will be as provided in the Supplementary Conditions.

Decisions on Disagreements:

9.9. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and

other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the execution and progress of the Work shall be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph, which ENGINEER will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter shall be delivered by the claimant to ENGINEER and the other party to the Agreement within fifteen days of the occurrence of the event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within forty-five days of such occurrence unless ENGINEER allows an additional period of time to ascertain more accurate data. In his capacity as interpreter and judge ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.10. The rendering of a decision by ENGINEER pursuant to paragraph 9.9 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or at law in respect of any such claim, dispute or other matter.

Limitations on ENGINEER's Responsibilities:

9.11. Neither ENGINEER's authority to act under this Article 9 or elsewhere in the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of ENGINEER to CONTRACTOR, any Subcontractor, any manufacturer, fabricator, supplier or distributor, or any of their agents or employees or any other person performing any of the Work.

9.12. Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used, to describe requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective never indicates that ENGINEER shall have authority to supervise or direct performance of the Work or authority to undertake responsibility contrary to the provisions of paragraphs 9.13 or 9.14.

9.13. ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

9.14. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractors, or of the agents or employees of any CONTRACTOR or Subcontractor, or of any other persons at the site or otherwise performing any of the Work.

ARTICLE 10—CHANGES IN THE WORK

10.1. Without invalidating the Agreement, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. Upon receipt of a Change Order, CONTRACTOR shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 11 or Article 12 on the basis of a claim made by either party.

10.2. ENGINEER may authorize minor changes in the Work not involving an adjustment in the Contract Price or the Contract Time, which are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and shall be binding on OWNER, and also on CONTRACTOR who shall perform the change promptly. If CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or Contract Time, CONTRACTOR may make a claim therefor as provided in Article 11 or Article 12.

10.3. Additional Work performed without authorization of a Change Order will not entitle CONTRACTOR to an increase in the Contract Price or an extension of the Contract Time, except in the case of an emergency as provided in paragraph 6.22 and except as provided in paragraphs 10.2 and 13.9.

10.4. OWNER shall execute appropriate Change Orders prepared by ENGINEER covering changes in the Work which are required by OWNER, or required because of unforeseen physical conditions or emergencies, or because of uncovering Work found not to be defective, or as provided in paragraphs 11.9 or 11.10, or because of any other claim of CONTRACTOR for a change in the Contract Time or the Contract Price which is recommended by ENGINEER.

10.5. If notice of any change affecting the general scope of the Work or change in the Contract Price is required by the provisions of any Bond to be given to the Surety, it will be CONTRACTOR's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. CONTRACTOR shall furnish proof of such adjustment to OWNER.

ARTICLE 11—CHANGE OF CONTRACT PRICE

11.1. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to

CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at his expense without change in the Contract Price.

11.2. The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered to OWNER and ENGINEER within fifteen days of the occurrence of the event giving rise to the claim. Notice of the amount of the claim with supporting data shall be delivered within forty-five days of such occurrence unless ENGINEER allows an additional period of time to ascertain accurate cost data. All claims for adjustment in the Contract Price shall be determined by ENGINEER if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

11.3. The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

11.3.1. Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.9).

11.3.2. By mutual acceptance of a lump sum.

11.3.3. On the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a Contractor's Fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work:

11.4. The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5:

11.4.1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing Work after regular working hours, on Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

11.4.2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to OWNER and CONTRACTOR shall make provisions so that they may be obtained.

11.4.3. Payments made by CONTRACTOR to the Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as CONTRACTOR's Cost of the Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4. Costs of special consultants (including, but not limited to, engineers, architects, testing laboratories, surveyors, lawyers and accountants) employed for services specifically related to the Work.

11.4.5. Supplemental costs including the following:

11.4.5.1. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR.

11.4.5.3. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof—all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4. Sales, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by any governmental authority.

11.4.5.5. Deposits lost for causes other than CONTRACTOR's negligence, royalty payments and fees for permits and licenses.

11.4.5.6. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by CONTRACTOR in connection with the execution of the Work, provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7. The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9. Cost of premiums for additional Bonds and insurance required because of changes in the Work.

11.5. The term Cost of the Work shall not include any of the following:

11.5.1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in his principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in subparagraph 11.4.1—all of which are to be considered administrative costs covered by the Contractor's Fee.

11.5.2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.

11.5.3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

11.5.4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the

Contract Documents to purchase and maintain the same (except for additional Bonds and insurance required because of changes in the Work).

11.5.5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

11.5.6. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

Contractor's Fee:

11.6. The Contractor's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1. a mutually acceptable fixed fee; or if none can be agreed upon,

11.6.2. a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1. for costs incurred under paragraphs 11.4.1 and 11.4.2, the Contractor's Fee shall be ten percent,

11.6.2.2. for costs incurred under paragraph 11.4.3, the Contractor's Fee shall be five percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to the Subcontractor as a fee for overhead and profit shall be ten percent, and

11.6.2.3. no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5.

11.7. The amount of credit to be allowed by CONTRACTOR to OWNER for any such change which results in a net decrease in cost, will be the amount of the actual net decrease. When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any.

Adjustment of Unit Prices:

11.8. Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, CONTRACTOR will submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.9. Where the quantity of Work with respect to any item that is covered by a unit price differs materially and significantly from the quantity of such Work indicated in the Contract Documents, an appropriate Change Order shall be issued on recommendation of ENGINEER to adjust the unit price.

Cash Allowances:

11.10. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors, manufacturers, fabricators, suppliers or distributors and for such sums within the limit of the allowances as may be acceptable to ENGINEER. Upon final payment, the Contract Price shall be adjusted as required and an appropriate Change Order issued. CONTRACTOR agrees that the original Contract Price includes such sums as CONTRACTOR deems proper for costs and profit on account of cash allowances. No demand for additional cost or profit in connection therewith will be valid.

ARTICLE 12—CHANGE OF THE CONTRACT TIME

12.1. The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to OWNER and ENGINEER within fifteen days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five days of such occurrence unless ENGINEER allows an additional period of time to ascertain more accurate data. All claims for adjustment in the Contract Time shall be determined by ENGINEER if OWNER and CONTRACTOR cannot otherwise agree. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

12.2. The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of CONTRACTOR if a claim is made therefor as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts or neglect by OWNER or others performing additional Work as contemplated by Article 7, or to fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

12.3. All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article 12 shall not exclude recovery for damages (including compensation for additional professional services) for delay by either party.

ARTICLE 13—WARRANTY AND GUARANTEE;
TESTS AND INSPECTIONS; CORRECTION,
REMOVAL OR ACCEPTANCE
OF DEFECTIVE WORK

Warranty and Guarantee:

13.1. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of all defects shall be given to CONTRACTOR. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2. ENGINEER and ENGINEER's representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspection and testing. CONTRACTOR shall provide proper and safe conditions for such access.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals.

13.4. If any law, ordinance, rule, regulation, code, or order of any public body having jurisdiction requires any Work (or part thereof) to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER's or ENGINEER's acceptance of a manufacturer, fabricator, supplier or distributor of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all other inspections, tests and approvals required by the Contract Documents shall be paid by OWNER (unless otherwise specified).

13.5. All inspections, tests or approvals other than those required by law, ordinance, rule, regulation, code or order of any public body having jurisdiction shall be performed by organizations acceptable to OWNER and CONTRACTOR (or by ENGINEER if so specified).

13.6. If any Work that is to be inspected, tested or approved is covered without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover such Work and ENGINEER has not acted with reasonable promptness in response to such notice.

13.7. Neither observations by ENGINEER nor inspections, tests or approvals by others shall relieve CONTRACTOR from his obligations to perform the Work in accordance with the Contract Documents.

Uncovering Work:

13.8. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

13.9. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's re-

quest, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction if he makes a claim therefor as provided in Articles 11 and 12.

Owner May Stop the Work:

13.10. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workmen or suitable materials or equipment, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

Correction or Removal of Defective Work:

13.11. If required by ENGINEER, CONTRACTOR shall promptly, without cost to OWNER and as specified by ENGINEER, either correct any defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with nondefective Work.

One Year Correction Period:

13.12. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions, either correct such defective Work, or, if it has been rejected by OWNER, remove it from the site and replace it with nondefective Work. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by CONTRACTOR.

Acceptance of Defective Work:

13.13. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so. In such case, if acceptance occurs prior to ENGINEER's recommendation

of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance occurs after such recommendation, an appropriate amount shall be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14. If CONTRACTOR fails within a reasonable time after written notice of ENGINEER to proceed to correct and to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including any requirements of the progress schedule), OWNER may, after seven days' written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising his rights under this paragraph OWNER shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees such access to the site as may be necessary to enable OWNER to exercise his rights under this paragraph. All direct and indirect costs of OWNER in exercising such rights shall be charged against CONTRACTOR in an amount verified by ENGINEER, and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents and a reduction in the Contract Price. Such direct and indirect costs shall include, in particular but without limitation, compensation for additional professional services required and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights hereunder.

ARTICLE 14—PAYMENTS TO CONTRACTOR AND COMPLETION

Schedules:

14.1 At least ten days prior to submitting the first Application for a progress payment, CONTRACTOR shall (except as otherwise specified in the General Requirements) submit to ENGINEER a progress schedule, a final schedule of Shop Drawing submission and where applicable a schedule of values of the Work. These schedules shall be satisfactory in form and substance to ENGINEER. The schedule of values shall include quantities and unit prices aggregating the Contract Price, and shall subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Upon acceptance of the schedule of values by ENGINEER, it shall be incorporated into a form of Application for Payment acceptable to ENGINEER.

Application for Progress Payment:

14.2. At least ten days before each progress payment falls due (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents and also as ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by such data, satisfactory to OWNER, as will establish OWNER's title to the material and equipment and protect OWNER's interest therein, including applicable insurance. Each subsequent Application for Payment shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied to discharge in full all of CONTRACTOR's obligations reflected in prior Applications for Payment. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3. CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

Review of Applications for Progress Payment:

14.4. ENGINEER will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application. OWNER shall, within ten days of presentation to him of the Application for Payment with ENGINEER's recommendation pay CONTRACTOR the amount recommended.

14.5. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of the Work in progress as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules that the Work has progressed to the point indicated; that, to the best of ENGINEER's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents and any qualifications stated in the recommendation; and that CONTRACTOR is entitled to payment of the amount recommended.

However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work, or that the means, methods, techniques, sequences, and procedures of construction have been reviewed or that any examination has been made to ascertain how or for what purpose CONTRACTOR has used the moneys paid or to be paid to CONTRACTOR on account of the Contract Price, or that title to any Work, materials or equipment has passed to OWNER free and clear of any Liens.

14.6. ENGINEER's recommendation of final payment will constitute an additional representation by ENGINEER to OWNER that the conditions precedent to CONTRACTOR's being entitled to final payment as set forth in paragraph 14.13 have been fulfilled.

14.7. ENGINEER may refuse to recommend the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to OWNER. He may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify and such payment previously recommended to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

14.7.1. the Work is defective, or completed Work has been damaged requiring correction or replacement,

14.7.2. written claims have been made against OWNER or Liens have been filed in connection with the Work,

14.7.3. the Contract Price has been reduced because of Modifications,

14.7.4. OWNER has been required to correct defective Work or complete the Work in accordance with paragraph 13.14,

14.7.5. of CONTRACTOR's unsatisfactory prosecution of the Work in accordance with the Contract Documents, or

14.7.6. CONTRACTOR's failure to make payment to Subcontractors, or for labor, materials or equipment.

Substantial Completion:

14.8. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall, in writing to OWNER and ENGINEER, certify that the entire Work is substantially complete and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving his reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will

prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which he may make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating his reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as he believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities and insurance. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER prior to his issuing the definitive certificate of Substantial Completion ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

14.9. OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

Partial Utilization:

14.10. Use by OWNER of completed portions of the Work may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any part of the Work which OWNER believes to be substantially complete and which may be so used without significant interference with construction of the other parts of the Work. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER and ENGINEER that said part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time thereafter OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving his reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, ENGINEER will execute and deliver to OWNER and CONTRACTOR a certificate to that effect, fixing the date

of Substantial Completion as to that part of the Work, attaching thereto a tentative list of items to be completed or corrected before final payment. Prior to issuing a certificate of Substantial Completion as to part of the Work ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, utilities and insurance for that part of the Work which shall become binding upon OWNER and CONTRACTOR at the time of issuing the definitive certificate of Substantial Completion as to that part of the Work unless OWNER and CONTRACTOR shall have otherwise agreed in writing and so informed ENGINEER. OWNER shall have the right to exclude CONTRACTOR from any part of the Work which ENGINEER has so certified to be substantially complete, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.10.2. In lieu of the issuance of a certificate of Substantial Completion as to part of the Work, OWNER may take over operation of a facility constituting part of the Work whether or not it is substantially complete if such facility is functionally and separately useable; provided that prior to any such takeover, OWNER and CONTRACTOR have agreed as to the division of responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, correction period, heat, utilities and insurance with respect to such facility.

14.10.3. No occupancy of part of the Work or taking over of operations of a facility will be accomplished prior to compliance with the requirements of paragraph 5.14 in respect of property insurance.

Final Inspection:

14.11. Upon written notice from CONTRACTOR that the Work is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies.

Final Application for Payment:

14.12. After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents and other documents—all as required by the Contract Documents, and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.16), CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents and such other data and schedules as ENGINEER may reasonably require, together with complete and legally effective releases or

waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or his property might in any way be responsible, have been paid or otherwise satisfied; and consent of the Surety, if any, to final payment. If any Subcontractor, manufacturer, fabricator, supplier or distributor fails to furnish a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

Final Payment and Acceptance:

14.13. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation—all as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR has fulfilled all of his obligations under the Contract Documents, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing his recommendation of payment and present the Application to OWNER for payment. Thereupon ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.16. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, OWNER shall, within thirty days after receipt thereof pay CONTRACTOR the amount recommended by ENGINEER.

14.14. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed thereof and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Contractor's Continuing Obligation:

14.15. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents

shall be absolute. Neither recommendation of any progress or final payment by ENGINEER, nor the issuance of a certificate of Substantial Completion, nor any payment by OWNER to CONTRACTOR under the Contract Documents, nor any use or occupancy of the Work or any part thereof by OWNER, nor any act of acceptance by OWNER nor any failure to do so, nor the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13, nor any correction of defective Work by OWNER shall constitute an acceptance of Work not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents.

Waiver of Claims:

14.16. The making and acceptance of final payment shall constitute:

14.16.1. a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.11 or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it shall not constitute a waiver by OWNER of any rights in respect of CONTRACTOR's continuing obligations under the Contract Documents; and

14.16.2. a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15—SUSPENSION OF WORK AND TERMINATION

Owner May Suspend Work:

15.1. OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER which shall fix the date on which Work shall be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if he makes a claim therefor as provided in Articles 11 and 12.

Owner May Terminate:

15.2. Upon the occurrence of any one or more of the following events:

15.2.1. if CONTRACTOR is adjudged a bankrupt or insolvent,

15.2.2. if CONTRACTOR makes a general assignment for the benefit of creditors,

15.2.3. if a trustee or receiver is appointed for CONTRACTOR or for any of CONTRACTOR's property,

15.2.4. if CONTRACTOR files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws,

15.2.5. if CONTRACTOR repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment,

15.2.6. if CONTRACTOR repeatedly fails to make prompt payments to Subcontractors or for labor, materials or equipment,

15.2.7. if CONTRACTOR disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction,

15.2.8. if CONTRACTOR disregards the authority of ENGINEER, or

15.2.9. if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents,

OWNER may after giving CONTRACTOR and his Surety seven days' written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the Work, including compensation for additional professional services, such excess shall be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such costs incurred by OWNER shall be verified by ENGINEER and incorporated in a Change Order, but in finishing the Work OWNER shall not be required to obtain the lowest figure for the Work performed.

15.3. Where CONTRACTOR's services have been so terminated by OWNER, the termination shall not affect any rights of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.4. Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Agreement. In such case, CONTRACTOR shall be paid for all Work executed and any expense sustained plus reasonable termination expenses.

Contractor May Stop Work or Terminate:

15.5. If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted, or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, terminate the Agreement and recover from OWNER payment for all Work executed and any expense sustained plus reasonable termination expenses. In addition and in lieu of terminating the Agreement, if ENGINEER has failed to act on an Application for Payment or OWNER has failed to make any payment as aforesaid, CONTRACTOR may upon seven days' notice to OWNER and ENGINEER stop the Work until payment of all amounts then due. The provisions of this paragraph shall not relieve CONTRACTOR of his obligations under paragraph 6.29 to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with OWNER.

ARTICLE 16—ARBITRATION

16.1. All claims, disputes and other matters in question between OWNER and CONTRACTOR arising out of, or relating to the Contract Documents or the breach thereof except for claims which have been waived by the making or acceptance of final payment as provided by paragraph 14.16, shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining subject to the limitations of this Article 16. This agreement so to arbitrate and any other agreement or consent to arbitrate entered into in accordance herewith as provided in this Article 16 will be specifically enforceable under the prevailing arbitration law of any court having jurisdiction.

16.2. No demand for arbitration of any claim, dispute or other matter that is required to be referred to ENGINEER initially for decision in accordance with paragraph 9.9 shall be made until the earlier of (a) the date on which ENGINEER has rendered a decision or (b) the tenth day after the parties have presented their evidence to ENGINEER if a written decision has not been rendered by ENGINEER before that date. No demand for arbitration of any such claim, dispute or other matter shall be made later than thirty days after the date on which ENGINEER has rendered a written decision in respect thereof in accordance with paragraph 9.9; and the failure to demand arbitration within said thirty days' period shall result in ENGINEER's decision being final and binding upon OWNER and CONTRACTOR. If ENGINEER renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

16.3. Notice of the demand for arbitration shall be filed in writing with the other party to the Agreement and with the

American Arbitration Association, and a copy shall be sent to ENGINEER for information. The demand for arbitration shall be made within the thirty-day period specified in paragraph 16.2 where applicable, and in all other cases within a reasonable time after the claim, dispute or other matter in question has arisen, and in no event shall any such demand be made after institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

16.4. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder or in any other manner any other person or entity (including ENGINEER, his agents, employees or consultants) who is not a party to this Agreement unless:

16.4.1. the inclusion of such other person or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration,

16.4.2. such other person or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings, and

16.4.3. the written consent of the other person or entity sought to be included and of OWNER and CONTRACTOR has been obtained for such inclusion, which consent shall make specific reference to this paragraph; but no such consent shall constitute consent to arbitration of any dispute not specifically described in such consent or to arbitration with any party not specifically identified in such consent.

16.5. The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and will not be subject to modification or appeal except to the extent permitted by Sections 10 and 11 of the Federal Arbitration Act (9 U.S.C. §§10, 11).

ARTICLE 17—MISCELLANEOUS

Giving Notice:

17.1. Whenever any provision of the Contract Documents requires the giving of written notice it shall be deemed to have

been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

Computation of Time:

17.2. When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

General:

17.3. Should OWNER or CONTRACTOR suffer injury or damage to his person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim shall be made in writing to the other party within a reasonable time of the first observance of such injury or damage.

17.4. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.30, 13.1, 13.11, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER thereunder, shall be in addition to, and shall not be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by law or contract, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph shall be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, warranties and guarantees made in the Contract Documents shall survive final payment and termination or completion of this Agreement.

CONSTRUCTION SPECIFICATION

SPECIAL CONDITIONS

SCOPE

This section of the specifications cover specific requirements, instructions and conditions applicable to this project only, which are not covered by the General Conditions or detailed specifications. Should there be conflicting statements between this section and other sections of these specifications, this section shall govern.

2. MAINTENANCE OF TRAFFIC

It is important that the Contractor shall at all times conduct his operations so that there are no interruptions of the use of the haul road. The exact procedure for controlling the traffic, for providing flag men when required, and for providing passage into and through work areas shall be worked out in advance of the phase of construction involved, between the Contractor, Engineer, and Owner.

3. CONTRACTOR TO MAINTAIN AND REPLACE STAKES

The Contractor shall furnish without charge, competent men from his force, stakes, tools and other materials, for the proper staking out of the work, in making measurements and surveys, and in establishing temporary or permanent reference marks in connection with the work. This does not mean to imply, the Contractor is to pay for initial staking, as this will be the cost of the Owner.

Initial staking to be provided by the Owner will be the establishment of:

- a. Bench Marks.
- b. Original lines and grades necessary for horizontal and vertical control of the construction of the permanent works.
- c. Right-of-way limits acquired through permits from Federal Agencies.

The Contractor shall provide surveys necessary to maintain the lines and grades during the construction of the permanent works.

LINES AND GRADES

All work done under this contract shall be done to the line, grades, and elevations shown on the plans, or as directed by the Engineer. The Contractor shall keep the Engineer

informed, a reasonable time in advance, of the times and places at which he intends to do work, in order that lines and grades may be furnished and necessary measurements for record and payment may be made with the minimum of inconvenience to the Engineer and delay to the Contractor.

b. **PAYMENT OF SUPPLIES AND SUBCONTRACTORS**

It is intended that the Contractor and subcontractor make full monthly payments to their suppliers and subcontractors as invoices are rendered. Such invoices shall be deemed as paid at the time each monthly certificate of payment is prepared by the Engineer. Affidavits will be submitted by the Contractor each as means of certifying to the Engineer that all equipment and materials delivered has been paid for. This will be the normal proof of payment; however, the Engineer will have the right at any time to demand copies of certified paid invoices. Failure or inability to provide such paid invoices will be sufficient cause for hold-up for further monthly pay estimates.

c. **GENERAL SAFETY REQUIREMENTS**

Excavations

- a. This section shall apply to all excavations in which workmen may be exposed to hazard of collapse of the banks, sides, or walls, during the time construction work is in process.
- b. All excavations shall be guarded by shoring, bracing or underpinning, or other methods as may be necessary to prevent injury to workmen resulting from the sides caving in.
- c. Excavated or other material must be deposited a safe distance from the edge of the excavation so as to prevent its falling or sliding back into the excavation.
- d. No trenches shall be left open at any time unless guarded with adequate barricades, warning lamps, and signs.
- e. Contractor's foremen and superintendents shall know where to obtain an oxygen resuscitator for use in an emergency. The phone number to call for immediate resuscitator and ambulance service shall be posted in all Contractors trench and at conspicuous places on the project at all times.

CERTIFICATIONS

Certifications that all materials used in the construction of the permanent works meet these specifications will be required. These certifications shall include the contract number, project name, bid item number, material furnished, applicable specification number and quantity furnished.

TEST

Test results that are required from the Contractor at the Contractor's expense will be performed as specified in the specifications. Duplicate copies of the test results shall be furnished to the Engineer for his approval at least 10 days prior to the use of the materials in the

permanent works. All "on site" testing shall be made in the presence of and be approved by the Engineer or his representative. Written test results for "on site" tests will not be required.

9. LIQUIDATED DAMAGES

If the work, or any part thereof, is not completed within the time agreed upon in this contract or any extension thereof, the contractor shall be liable to the owner in the amount of \$500.00 per day for each and every calendar day the completion of the work is delayed beyond the time provided in this contract, as fixed and agreed liquidated damages and not as a penalty, and the Owner shall have the right to deduct from the retainage of the moneys which may be then due or which may be due and payable to the Contractor, the amount of the liquidated damages; and if the amount so retained by the owner is insufficient to pay in full such liquidated damages, the Contractor shall pay to the Owner the amount necessary to effect payment in full of such liquidated damages.

10. EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND SITES

The bidder is required to examine carefully the site of the proposed work, the proposal, plans, specifications, supplemental specification, special provision, and contract forms before submitting a proposal.

The submission of a bid shall be considered PRIMA FACIE evidence that the Bidder has made the required examinations and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the contract.

11. DITCH RESTORATION

All irrigation or drainage ditches and structures damaged as a result of Contractor's work shall be restored by Contractor. Such restorations shall be completed as soon after the immediate work has been completed as possible. Any waste material shall be removed or properly cleaned up.

12. OVERTIME WORK

The Contractor shall not work after the hours of 5:00 p.m., before 8:00 a.m., or on Saturdays, Sundays or holidays without written consent of the Engineer.

13. DUST CONTROL

The Contractor will be required to provide dust control through the use of water truck when, in the opinion of the Engineer, dust becomes excessive.

14. WASTE MATERIAL

The Contractor shall be responsible for disposal of waste material from the site. Disposal area must be approved by the Engineer prior to use.

5. SUPERVISION BY CONTRACTOR

The Contractor will supervise and direct work. He will be solely responsible for the means, techniques, sequences and procedures of construction. The Contractor will employ and maintain on the work site a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the contractor's representative at the site. The supervisor or superintendent shall have full authority to act on behalf of the contractor and all communications given to the supervisor shall be as binding as if given to the contractor. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the work.

5. CONTRACTOR'S PERSONNEL

All work under this contract shall be performed in a skillful and workmanlike manner. The Owner may, in writing, require the Contractor to remove from the work any employee the Owner deems incompetent, careless, or otherwise objectionable.

17. GENERAL PROVISION AMENDMENT

Article 16 "Arbitration" of the general provisions is herein deleted. All claims, disputes and other matters in question between Owner and Contractor arising out of, or relating to the Contract Documents, or the breach thereof, except for claims which have been waived by the making or acceptance of final payment as provided by paragraph 14.16 shall be decided through regular civil court procedures and this contract can not be misconstrued as an agreement to arbitrate.

18. GUARANTEE OF THE WORK

The Contractor shall, for a period of one(1) year after completion and acceptance of the work, maintain and repair any defective work which may occur to the permanent work.

The Contractor shall, for a period of one (1) year after completion and acceptance of the work, maintain and repair any trench settlement which may occur and shall make suitable repairs to any roadways or other structures which may be damaged as a result of backfill settlement.

9. RETAINAGE ON PROGRESS PAYMENTS

Ten percent (10%) will be retained on each progress payment to the

Contractor until final completion and acceptance of all work. The Owner may reduce the retainage to 5%, after 50% of the work is completed at his sole discretion and upon the recommendation of the Engineer.

20. LIABILITY INSURANCE

Before the contract is executed the Contractor with the successful bid shall be required to furnish to Owner, a copy of the public liability and property damage insurance policy in an amount of no less than \$1,000,000 which is to be in force and applicable to the project. In addition, the Contractor shall be required to furnish, at the same time a letter from agent for the company holding said policy, stating that he will inform Owner of any change in the status of the policy.

21. WORK SCHEDULE

All work involved with furnishing and installing Bid Items 3,4,5,9,10 & 14 must be performed between the dates of June 29 and July 13, 1991. There will be no exceptions. A work schedule showing the sequence and date of each item of work will be presented to the Engineer for his approval at the time of the pre-construction conference.

2. ASPHALT QUOTES

Contractor shall submit at least two separate asphalt quotes to the Engineer at the time of bidding the project.

23. SEDIMENT CONTROL (Silt Fences by Genwal)

Contractor will prevent material from entering the stream near the construction site. Silt fences will be required at all construction sites to prevent debris from entering the stream as shown on the drawings. Straw bales will also be placed in the stream for sediment control during the work period. Two dams are required at each site. Removal of the dams and silt deposits are required at the completion of the project.

24. STAGING AREA

Contractor will be able to use the existing staging area for excavation stockpiling and chip stockpiling. After the area is no longer needed, the Contractor will be required to reclaim the staging area.

25. TOP SOIL

All disturbed areas will require top soil replacement and re-seeding in accordance with Genwall's permits.

5. All construction should be performed in accordance with design specification which include provisions for erosion control.

27. Construction work should be scheduled to limit exposure of unprotected soil surfaces to the work area required for seasonal construction operations.
28. Excavation should be postponed during periods of heavy rainfall or snowmelt unless materials can be placed and stabilized as designed.
29. Contractor will be required to submit to the Engineer a plan for sediment and erosion control before beginning construction.

CONSTRUCTION SPECIFICATION

8. MOBILIZATION

1. SCOPE

The work shall consist of the mobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

It shall include the purchase of contract bonds, transportation of personnel, equipment, and operating supplies to the site; establishment of office, buildings, construction signing in accordance with UDOT standards, and other necessary facilities at the site; and other preparatory work at the site.

It shall not include mobilization for any specific item of work for which payment for mobilization is provided elsewhere in the contract.

This specification covers mobilization of work required by the contract at the time of award. If additional mobilization costs are incurred during performance of the contract as a result of change or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the items of work changed or added.

2. PAYMENT

Payment will be made as the work proceeds, after presentation of invoices by the contractor showing his own mobilizations costs and evidence of the charges of suppliers, subcontractors, and others for mobilization work performed by them. If the total of such payments is less than the contract lump sum for mobilization, the unpaid balance will be included in the final contract payment. Total payment will be the lump sum contract price for mobilization, regardless of actual cost to the Contractor.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated into the project, or the purchase costs of operating supplies.

Payment of the lump sum contract price for mobilization will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to completion of the work.

Compensation for any item of work described in the contract but not listed on the bid schedule will be included in the payment for the item or work to which it is made subsidiary.

Such items and the items to which they are made subsidiary are identified in Section 3 of this specification.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 1 - Mobilization

1. This item shall consist of the mobilization of the Contractor's forces and equipment, as defined in Section 1, required for performing the work under this contract.
2. Payment will be made in accordance with Section 2.

CONSTRUCTION SPECIFICATIONS

10. HOT BITUMINOUS PLANT MIX

1. SCOPE

The work shall consist of the construction of a surface course composed of mineral aggregate and bituminous binder, placed and compacted within the lines and grades shown on the plans.

2. MATERIALS

- a. Asphaltic Cements: Viscosity grades of asphalt cement prepared from petroleum shall conform to the requirements of AASHTO Designation M-226.
- b. Asphaltic Emulsions: Anionic emulsified asphalt shall conform to the requirements of AASHTO Designation M-140.
- c. Mineral Aggregate: Mineral aggregate shall consist of crushed stone, crushed gravel, conforming to the following requirements:
 1. Course aggregate retained on the No. 4 sieve shall consist of clean, hard, tough, durable, and sound fragments, with not more than 3 percent by weight of flat, elongated, soft, or disintegrated particles, and shall be free from vegetable matter or other deleterious substances.
 2. That portion of the aggregate retained as the No. 4 Sieve shall have not less than 50% of particles by weight with at least one mechanically fractured face, or clean angular face.
 3. The aggregate shall have a percentage of wear not exceeding 50% for road mix and 40% for plant mix, when tested in accordance with AASHTO Designation T-96. The Contractor shall certify that the mineral aggregate used on the job shall meet this wear test prior to its placement in the surface course.
 4. Fine aggregate passing the No. 4 sieve, may be either a natural or manufactured product. The aggregate shall be clean, hard-grained and moderately sharp, and shall contain not more than 2 percent by weight of vegetable matter or other deleterious substances.
 5. That portion of the fine aggregate passing the No. 40 sieve shall be nonplastic when tested in accordance with AASHTO Designation T-90.

6. The weight of minus 200 mesh material retained in the aggregate as determined by the difference in percent passing a no. 200 sieve by washing and dry sieving without washing shall not exceed 6 percent of the total sample weight.
7. The combined mineral aggregate plus any specified additives, when mixed with the specified bituminous binder in accordance with ASTM Designation D-1559, shall conform to the following requirements:

Marshall Stability 1200-2500 lbs.
 Flow (0.01 inch) 10-18
 Voids content 1.5% to 3.0%

The requirements specified in this subsection shall be used to determine the suitability of the aggregate sources.

8. The combined dry mineral aggregate shall be uniformly graded and of such size that it meets one of the following gradation bands:

1" Gradation

<u>Sieve Size</u>	<u>% Passing Gradation Band</u>
1"	100
1/2"	70-100
#4	41-68
#8	32-52
#16	24-40
#50	15-25
#200	5-10

3/4" Gradation

3/4"	100
3/8"	70-100
#4	48-76
#8	36-59
#16	27-45
#50	16-29
#200	5-11

1/2" Gradation

1/2"	100
#4	61-100
#8	43-75
#16	32-55
#50	19-33
#200	7.12

Any deviation from the above gradation Bands must be approved in writing by the Engineer.

3. CONSTRUCTION METHODS

1. Hot Mix Plant: The mineral aggregate and bituminous binder shall be mixed at a central mixing plant. The shortest mixing time consistent with satisfactory coating of the aggregate shall be used, as determined by the Engineer. The mineral aggregate shall be considered satisfactorily coated with bitumen when all of the particles passing the No. 4 sieve and 98 percent of the particles retained on the No. 4 sieve are coated.
2. Spreading and Compaction: The mixture shall be spread and struck-off in such a manner that finished surface shall conform to the elevations, grades, and cross-sections shown on the drawings or as staked in the field.

After the mixture has been spread, the surface shall be longitudinally rolled, beginning at the outside edge or lower side and proceeding toward the high side. Each pass of one roller shall overlap the preceding pass by at least on-half the width of the roller. The surface shall be rolled by 4 passes with a pneumatic or steel-wheel exerting a minimum pressure of 40 psi., or by an approved equal method. Rolling operations shall be conducted in such a manner that shoving or distortion will not develop beneath the roller.

3. Finishing: The surface shall be finished to a smooth, uniform line and grade with surface deviations not exceeding 3/8-inch in 10 feet. Determination of compliance with smoothness may be made with a straight edge, chalk-line, or profilograph at the option of the Engineer. Any irregularities shall be satisfactorily corrected at the expense of the Contractor.
4. Temperature Control: The minimum temperature of the bituminous material at the time of application shall be 250 degrees Fahrenheit.
5. Weather Limitations: Bituminous material shall not be applied when weather conditions are unfavorable or when the air temperature in the shade is less than 50° F.
6. Weight Devices: When the method of measurement is by weight, the Contractor shall provide weigh scales and a weigh-house, at the job site, and shall transport the material so it can be weighed.

All weighing shall be done on platform scales of sufficient length and capacity to permit the entire vehicle to rest upon the scales.

The scales shall be accurate to within 1 percent of the correct weight throughout the range of use. Before using the scales and as frequently thereafter as the Engineer determines necessary to ensure accuracy, the Contractor shall have the scales checked, adjusted, and certified by a representative of the State agency. The Contractor shall maintain the scales to the required accuracy.

All weighing will be done by a weigh person provided and compensated by the Engineer, except for material weighed on other certified scales.

The weigh-house shall be large enough to protect the scales mechanism and weighperson from the weather and sturdy enough to provide secure storage for records and equipment used by the weighperson.

The building and scales shall remain the property of the Contractor and shall be removed upon completion of the work.

7. Sampling of Aggregate. The Contractor shall submit test results and a certification of compliance that states that the gradation of the aggregate meets the contract requirements. The contractor shall equip crushing, screening, and mixing plants with sampling devices. The Contractor shall take additional samples of material for testing as directed by the Engineer. These samples may be required at any time to validate the certification furnished by the Contractor.

Provisions shall be made for accurate proportioning. Each compartment shall have an outlet feed that can be shut off completely and shall be equipped with an automatic plant shutoff that operates when any bin becomes empty. The bins or aggregate feeding system shall be constructed so samples can be readily obtained.

Positive weight measurement of the combined cold feed shall be maintained to allow regulation of the feed gate and permit automatic correction for variations in load.

The bitumen feed control shall be coupled with the total aggregate weight measurement device to automatically vary the bitumen feed rate and to maintain the required proportion. Means shall be provided for checking the quantity or rate of flow of bitumen into the mixing unit.

Thermometers shall be fixed in the bitumen feed line at the charging valve of the mixer unit and at the discharge chute of the mixer unit. The Engineer may require replacement of any thermometer by an approved temperature-recording apparatus to allow better regulation of the material temperature.

A method shall be provided to automatically adjust the bituminous content in the mix for moisture variations in the cold feed.

8. Hauling Equipment. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a material to prevent the mixture from adhering to the beds. Truck beds shall be drained prior to loading. Each truck shall have a cover to protect the mixture from the weather. When necessary to ensure that the mixture will be delivered at the specified temperature, truck beds shall be insulated and covers shall be securely fastened.

9. Bituminous Pavers. Bituminous pavers shall be self-contained, power-propelled units, provided with an adjustable activated-screed or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths and thicknesses shown on the drawings. When shown on the drawings, pavers shall be equipped with a control system capable of automatically maintaining the proper screed elevation. The control system shall be automatically actuated from either a reference line or surface through a system of sensors that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope control system shall be capable of being made inoperative so that the screed can be controlled by mechanisms that will independently control the elevation of each end of the screed from reference line or surfaces.

The controls shall be capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 30 feet in length.
- b. Taut stringline (wire) set to grade.
- c. Short ski or shoe.

10. Compaction shall be performed with either vibratory steel-wheel or steel-wheel and pneumatic-tire rollers.

Rolling shall begin at the sides and proceed longitudinally parallel to the road centerline, each trip overlapping one-half the roller width, gradually progressing to the center. When paving in echelons or abutting a previously placed lane, the longitudinal joint shall be rolled first, then followed by the above rolling procedure. On superelevated curves the rolling shall begin at the low side and progress to the high side.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or mechanical tampers.

11. Joints, trimming edges, and cleanup. Placing of the bituminous mixture shall be continuous. Rollers shall not pass over the unprotected end of a freshly laid mixture. Transverse joints shall be formed by cutting back into the previous run to expose the full depth of the course. Heat shall be applied to contact surfaces or transverse joints just before any additional mixture is placed against the previously rolled material.

4. FLUSH COAT

When required, the coat shall be placed on the completed surface course. The coat shall not be placed within 7 days after the surface course is laid. Prior to placing the coat, the existing surface shall be cleaned of all dirt, sand, dust, or other objectionable material.

The material shall be sprayed over the prepared surface by means of a pressure distributor.

5. ACCEPTANCE SAMPLING AND TESTING

1. Finished work samples. The Contractor shall cut samples from the pavement. Samples size and locations will be designated by the Engineer. Samples shall be neatly cut with a saw or core drill. Voids left by sampling shall be backfilled and compacted to the density of the surrounding material.
2. Acceptance sampling and testing of bituminous mixture (gradation and bituminous content). Acceptance samples of the mixture will be taken after it has been discharged into hauling units. Samples will be selected on a random basis.
3. Samples will be tested by the Contractor, at the Contractors expense, for bitumen content by means of AASHTO T 164 or by the vacuum extractor test currently approved by the Engineer. For tar mixture use ASTM D 2172, Method A. Gradation of the entire quantity of extracted aggregate shall be determined in accordance with AASHTO T 30. Test results will be compared to the job mix formula.
4. Acceptance sampling and testing bituminous mixture (compaction). After the bituminous mixture has been placed and compacted, the pavement shall meet the following density requirements.

<u>Location</u>	<u>Percent of Relative Maximum Density From Job Mix Formula</u>
Travel lanes (all lifts)	92 min.
Shoulders	90 min.

Samples and test will be taken as frequently and at such locations as the Engineers elects. Testing will be done by the Contractor at the Contractors expense and will be in accordance with AASHTO T 230 or other approved methods.

5. Acceptance sampling and testing of bituminous mixture (surface and thickness tolerance).
 - a. Surface. Acceptance testing will be performed on the top surface. The surface will be tested by the Engineer with a 10-foot straightedge. The variation of the surface from the testing edge of the straightedge shall not deviate at any point more than 3/8-inch.

- b. Thickness The total compacted thickness of the mixture shall not vary more than $\frac{1}{4}$ inch from the specified thickness. The compacted thickness shall not consistently be below nor consistently above the specified thickness.

The Engineer reserves the right to test areas which appear defective and require immediate correction.

6. MEASUREMENT AND PAYMENT

- a. The bituminous material and mineral aggregate shall be measured by the ton.
- b. The bituminous flush coat material shall be measured by the ton.
- c. Payment for the bituminous material, mineral aggregate will be made at the contract unit price. Such payment will constitute full compensation for furnishing, mixing, spreading, the bituminous material and mineral aggregate, compacting and all other items necessary and incidental to the performance of the work.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and construction details are:

- a. Bid Item 3, Mineral Aggregate & Bituminous Material, Grade AC-10
1. This item shall consist of furnishing the mineral aggregate, bituminous material, mixing the aggregate and bituminous material, spreading, and compacting the mixture to the lines and grades shown on the drawings or as staked in the field.
 2. The aggregate shall meet the 3/4-inch gradation requirements as listed in Section 2.C.8 of these specifications. The borrow area selected by the Contractor must meet the approval of the Engineer
 3. The asphalt shall be grade AC-10, visocsity graded, and shall be applied at an approximate rate of 6.25% by weight.
 4. The aggregates and the bituminous material shall be measured or gaged and introduced into the mixer in the amount specified by the job mix formula.

After the required amounts of aggregate and bituminous material have been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a through distribution of the the bituminous material throughout the aggregate is obtained.

5. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be placed and finished by hand tools.
6. Hot mixture shall be placed at a temperature not less than 250 degrees fahrenheit, measured in the truck just prior to dumping into the spreader.
7. Material trimmed from the edges and any other discarded bituminous mixture shall be removed from the roadway and disposed of by the Contractor in an approved area.
8. Contractor will be required to tightblade and compact the existing untreated base course material prior to placement of bituminous material.
9. Time limitation: The Contractor shall blade the untreated base course and apply the asphalt surface course during the 1991 miner's vacation which is June 29 through July 13, 1991.
10. The contact edge with the pavement on U-31 shall be cut with an asphalt cutter to provide a vertical contact face. Proper signing, flagmen, and other UDOT permit requirements will be complied with. Contractor will be responsible to obtain a permit to work on UDOT right-of-way and supply any required bonds.
11. All drainage inlet structures on the concrete bridge shall be protected from the asphalt placement.
12. Measurement & payment shall be in accordance with Section 6 of these specifications.

b. Bid Item 4, Bituminous Material Grade LM-CRS-2H

c. Bid Item 5, Cover Material Type A

1. This item shall consist of furnishing and applying the asphalt seal coat and cover material to the finished surface course.
2. Surface Preparation: The existing surface shall be clean of all dirt, sand, dust or other objectionable material.
3. Application of Bituminous Material: The material shall be sprayed over the prepared surface by means of a pressure distributor. The rate of application will be 0.4 gallons per square yard, or as determined by the Engineer.

Application of bituminous material shall not be more than 500 feet in advance of the placing of cover material.

Joints between applications shall be made by starting the distributor on building paper. Valve action shall be instantaneous, both in starting and cut off.

The minimum temperature of the bituminous material at the time of application shall be a minimum of 150 degrees fahrenheit. The bituminous material shall consist of LM-CRS-2H, unless otherwise directed by the Engineer.

4. The cover material shall be uniformly graded within the gradation limits specified below, when tested in accordance with AASHTO Designation T-27.

<u>SIEVE SIZE</u>	<u>TYPE A</u>
5/8	
1/2	100
3/8	85-100
1/4	
No. 4	5-20
No. 8	0-5
No. 16	
No. 50	
No. 200	0-1

5. Spreading and Compacting of Cover Material: Cover material shall be pre-dampened in stockpile at least 24 hours in advance, but not more than 48 hours, prior to placing. The cover material shall be spread immediately after applying the bituminous material by means of an approved spreader which can be adjusted to uniformly spread the required amount of aggregate.

Provisions shall be made so that the larger particles will be deposited first. The rate of cover material application will be 23 pounds per square yard, or as determined by the Engineer. Immediately after spreading, the cover material shall be hand broomed, if necessary, to distribute the aggregate uniformly over the surface. After the cover material has been satisfactorily spread, the surface shall be rolled a minimum of two passes in a longitudinal direction.

Rolling shall be performed in a manner and time so that the aggregate is properly imbedded into the binder before the binder starts to set. Surplus cover material shall be removed from the roadway, by brooming, as directed by the Engineer.

Spreading and rolling will not be paid for separately, but will be a subsidiary item to Bid Item 5, Cover Material Type A.

6. Weather and Seasonal Limitations: Seal coat shall be applied prior to July 13, 1991, and when the air temperature in the shade and the roadbed temperature are above 75 degrees fahrenheit. Seal coat shall not be applied during rain, fog, or other adverse weather conditions.

7. Stockpiling Cover Material: Cover material shall be stockpiled in such quantities as contained in the bidding schedule or as the Engineer may direct. Prior to stockpiling, the sites shall be cleared and leveled. The stockpile site shall be dry and stable during the stockpile process. The loads shall be butted one against the other in such a manner as to occupy as small an area as possible, but also to allow a count verification with receipted delivery invoice.
8. Under no circumstances shall traffic be permitted to travel over the tacked surface until the bituminous material has cured so as to not be picked up by traffic. If detours cannot be provided, the Contractor shall restrict his operation to a width that will permit at least one-way traffic over the remaining portion of the road. If one-way traffic is provided, the traffic shall be controlled by flagging or pilot car operation at Contractor's expense.
9. Measurement and Payment will be as specified in the bid schedule.

d. Bid Item 14, Bituminous Material Grade SS-1H

1. This item shall consist of furnishing and applying the asphalt prime coat to the finished untreated base course.
2. Surface Preparation: The existing surface shall be clean of all dirt, sand, dust or other objectionable material.
3. Application of Bituminous Material: The material shall be sprayed over the prepared surface by means of a pressure distributor. The rate of application will be 0.10 gallons per square yard, or as determined by the Engineer.
4. Under no circumstances shall traffic be permitted to travel over the tacked surface until the bituminous material has cured so as to not be picked up by traffic. If detours cannot be provided, the Contractor shall restrict his operation to a width that will permit at least one-way traffic is provided, the traffic shall be controlled by flagging or pilot car operation at Contractor's expense.
5. Measurement and payment will be by section 6 of these specifications.

CONSTRUCTION SPECIFICATION

21. EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specification and disposal of the excavated materials.

2. CLASSIFICATION

Excavation will be classified as common excavation or rock excavation in accordance with the following definitions or will be designated as unclassified.

Common excavation shall be defined as the excavation of all materials that can be excavated, transported, and unloaded by the use of heavy ripping equipment and wheel tractor-scrappers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard and equipped with attachments (such as shovel, bucket, backhoe, dragline or clam shell) appropriate to the character of the materials and the site conditions.

Rock excavation shall be defined as the excavation of all hard, compacted or cemented materials the accomplishment of which requires blasting or the use of excavators larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than one cubic yard in volume encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation.

Excavation will be classified according to the above definitions by the Engineer, based on his judgement of the character of the materials and the site conditions.

The presence of isolated boulders or rock fragments larger than one cubic yard in size will not in itself be sufficient cause to change the classification of the surrounding material.

For the purpose of this classification, the following definitions shall apply:

Heavy ripping equipment shall be defined as a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a tractor having a power rating of 200-300 net horsepower (at the flywheel).

Wheel tractor-scraper shall be defined as a self-loading (not elevating) and unloading scraper having a struck bowl capacity of 12-20 yards. Pusher tractor shall be defined as

a track type tractor having a power rating of 200-300 net horsepower (at the flywheel) equipped with appropriate attachments.

3. UNCLASSIFIED EXCAVATION

Items designated as "Unclassified Excavation" shall include all materials encountered regardless of their nature or the manner in which they are removed. When excavation is unclassified, none of the definitions or classifications stated in Section 12 of this specification shall apply.

4. BLASTING

The transportation, hauling, storage, and use of dynamite and other explosives shall be directed and supervised by a person of proven experience and ability in blasting operations.

Blasting shall be done in such a way as to prevent damage to the work or unnecessary fracturing of the foundation and shall conform to any special requirements in Section 12 of this specification.

5. USE OF EXCAVATED MATERIALS

Method 1

To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent earth fill or rock fill. The suitability of materials for specific purposes will be determined by the Engineer. The Contractor shall not waste or otherwise dispose of suitable excavated materials.

Method 2

Suitable materials from the specified excavations may be used in the construction of required earth fill or rock fill. The suitability of materials for specific purposes will be determined by the Engineer.

6. DISPOSAL OF WASTE MATERIALS

Method 1

All surplus or unsuitable material will be designated as waste and shall be disposed of at the location shown on the drawings.

Method 2

7. BRACING AND SHORING

Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring, and other supporting installations. The contractor shall furnish, place and subsequently remove such supporting installations.

8. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavation shall be completed to the specified elevations and to sufficient length and width to include allowance for forms, bracing and supports, as necessary, before any concrete or earth fill is placed or any piles are driven within the limits of the excavation.

9. BORROW EXCAVATION

When the quantities or suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as directed by the Engineer.

Borrow pits shall be excavated and finally dressed in a manner to eliminate steep or unstable side slopes or other hazardous or unsightly conditions.

10. OVER EXCAVATION

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the Engineer. Concrete that will be exposed to the atmosphere when construction is completed shall contain not less than 6 sacks of cement per cubic yard of concrete. The concrete shall be placed and cured as specified by the Engineer. Over excavation in other material shall be backfilled and fine graded with granular material having less than 15% fines.

11. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Regardless of quantities excavated, the measurement for payment will be made to the specified pay limits, except that excavation

outside the specified lines and grades directed by the Engineer to remove unsuitable material will be included, but only to the extent the unsuitable condition is not the result of the Contractor's operations.

Method 1

The pay limits shall be as designated on the drawings.

Method 2

The pay limits shall be defined as follows:

- a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be modified ground surface resulting from the specified previous excavation or fill.
- b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

Method 3

The pay limits shall be defined as follows:

- a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.
- b. The lower and lateral limits shall be the true surface of the completed excavation as authorized by the Engineer.

Method 4

The pay limits shall be defined as follows:

- a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.
- b. The lower limit shall be at the bottom surface of the proposed structure.
- c. The lateral limits shall be 18 inches outside of the outside surfaces of the proposed structure or shall be vertical planes 18 inches outside of and parallel to the footings, whichever gives the larger pay quantity, except

as provided in d. below.

- d. For trapezoidal channel linings or similar structures that are to be supported upon the sides of the excavation without intervening forms, the lateral limits shall be at the under side of the proposed lining or structure.
- e. For the purpose of the definitions in b, c, and d, above, any specified bedding or drain fill directly beneath or beside the structure will be considered to be a part of the structure.

Use with all Methods

Payment for each type and class of excavation will be made at the contract unit price for that type and class of excavation. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work, except that extra payment for backfilling required over excavation will be made in accordance with the following provision:

- a. Payment for backfilling over excavation, as specified in Section 12 of this specification, will be made only if the excavation outside specified lines and grades is directed by the Engineer to remove unsuitable material and if the unsuitable condition is not a result of the Contractor's operations.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 12 of this specification.

12. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in accordance with this specification and the construction details thereof are as follows:

a. Bid Item 2, Excavation

1. This item shall consist of the excavation necessary to install the gabion retaining wall and obtain the typical section as shown on the drawings and as directed by the Engineer.
2. All excavated material shall be stockpiled and used for embankment as shown on the drawings. The material shall be compacted to 95% of maximum density obtained from a modified proctor test, AASHTO T180, Method C. Moisture content of material at time of compaction shall be within 2% of optimum.

3. Water will not be paid for as a separate item, but will be subsidiary to this item.
4. Measurement of the quantity of excavation shall be between the original ground shown by cross section and the final limits of excavation. Payment will be by the cubic yard of material actually excavated and compacted at the unit price shown on the bid schedule.

CONSTRUCTION SPECIFICATION

23. EARTH FILL

1. SCOPE

The work shall consist of the construction of earth embankments and other earth fills required by the drawings and specifications.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing and disposition of materials in the various fills shall be subject to approval by the Engineer.

Fill materials shall contain no sod, brush, roots or other perishable materials. Rock particles larger than the maximum size specified for each type of fill shall be removed prior to compaction of the fill.

The type of materials used in the various fills shall be as listed and described in the specifications and drawings.

3. FOUNDATION PREPARATION

Foundations for earth fill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earth fill, and the surface materials of the foundation shall be compacted and bonded with the first layer of earth fill as specified for subsequent layers of earth fill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the earth fill can be compacted against them to effect a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose materials by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earth fill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be not steeper than 1 horizontal to 1 vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earth fill conforming to the specifications for the earth fill to be placed upon the foundation.

4. PLACEMENT

Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Fill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted. Hand compacted fill, including fill compacted by manually directed power tampers, shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of fill compacted by manually directed power tampers.

Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earth fill in dams, levees and other structures designed to restrain the movement of water shall be placed so as to meet the following additional requirements:

- a. The distribution of materials throughout each zone shall be essentially uniform, and the fill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material.
- b. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.
- c. The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of not less than 2 percent shall be maintained to insure effective drainage, and except as otherwise specified for drain fill zones. If the drawings or specifications require or the Engineer directs that the fill be placed at a higher level in one part of an embankment than another, the top surface of each part shall be maintained as specified above.
- d. Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of stream flow during construction are specifically authorized in the contract.
- e. Embankments built at different levels as described under c or d above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all loose material, and shall be scarified, moistened and recompact when the new fill is placed against it as needed to insure a good bond with the new fill and to obtain the specified moisture content and density in the junction of the in place and new fill.

5. CONTROL OF MOISTURE CONTENT

During placement and compaction of fill, the moisture content of the materials being placed shall be maintained within the specified range.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the materials after placement on the fill, if necessary. Uniform moisture distribution shall be obtained by discing, blanding or other approved methods prior to compaction of the layer.

Material that is too wet when deposited on the fill shall either be removed or be dried to the specified content prior to compaction.

If the top surface of the preceding layer of compacted fill or a foundation or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond it shall be scarified and moistened by sprinkling to an acceptable moisture content prior to placement of the next layer of fill.

6. COMPACTION

Earth fill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction. Each layer of fill shall be compacted as necessary to make the density of the fill matrix not less than the minimum density specified. The fill matrix is defined as the portion of the fill material finer than the maximum particle size used in the compaction test method specified.

Class B compaction. Each layer of fill shall be compacted to a mass density not less than the minimum density specified.

Class C compaction. Each layer of fill shall be compacted by the specified number of passes of the type and weight of roller or other equipment specified or by an approved equivalent method. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

Fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping if permitted by the Contracting Officer, or manually directed power tampers or plate vibrators. Heavy equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted.

The passage of heavy equipment will not be allowed: (1) over cast-in-place conduits prior to 14 days after placement of the concrete; (2) over cradled precast conduits prior to 7 days after placement of the concrete cradle, or (3) over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or 2 feet, whichever is greater.

Compacting of fill adjacent to structures shall not be started until the concrete has attained the strength specified in Section for this purpose. The strength will be determined by compression testing of test cylinders cast in the manner for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of fill adjacent to structures shall not be started until the following time intervals have elapsed after placement of the concrete.

<u>Structure</u>	<u>Time Interval</u>
Retaining walls and counterforts	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and spillway risers, cast-in-place (with inside forms in place)	7 days
Conduits and spillway risers, cast-in-place (inside forms removed)	14 days
Conduits, precast & cradled	2 days
Conduits, precast, bedded	1 day
Antiseep collars and cantilever outlet bents	3 days

7. REMOVAL AND PLACEMENT OF DEFECTIVE FILL

Fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable fill. The replacement fill and the foundation, abutment and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control and compaction.

8. TESTING

During the course of the work, the Engineer will perform such tests as are required to identify materials, to determine compaction characteristics, to determine content, and to determine density of fill in place. These tests performed by the Engineer will be used to verify that the fills conform to the requirements of the specifications. Such tests are not intended to provide the Contractor with the information required by him for the proper execution of the work and their performance shall not relieve the Contractor of the necessity to perform tests for that purpose.

Densities of fill requiring Class A compaction will be determined by the Engineer in accordance with ASTM Method D 1556 (or by equivalent methods), except that the volume and moist weight of included rock particles larger than those used in the compaction test method specified for the type of fill will be determined and deducted from the volume and moist weight of the total sample prior to computation of density. The density so computed will be used to determine the percent compaction of the fill matrix.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earth fill within the specified zone boundaries and pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Unless otherwise specified, no deduction in volume will be made for embedded conduits and appurtenances.

The pay limits shall be as defined below, with the further provision that earth fill required to fill voids resulting from overexcavation of the foundation, outside the specified lines and grades, will be included in the measurement for payment only where such overexcavation is directed by the Engineer to remove unsuitable material and where the unsuitable condition is not a result of the Contractor's operations.

(Method 1) The pay limits shall be as designated on the drawings.

(Method 2) The pay limits shall be the measured surface of the foundation when approved for placement of the fill and the specified neat lines of the fill surface.

(Method 3) The pay limits shall be the measured surface of the foundation when approved for placement of the fill and the measured surface of the completed fill.

(Method 4) The pay limits shall be the specified pay limits for excavation and the specified neat lines of the fill surface.

(Method 5) The pay limits shall be the specified pay limits for excavation and the measured surface of the completed fill.

(Use method 6 or 7 with all methods 1 through 5)

(Method 6) Payment for each type and compaction class of earth fill will be made at the contract unit price for that type and compaction class of fill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

(Method 7) Payment for each type and compaction class of earth fill will be made at the contract unit price for that type and compaction class of fill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work, except furnishing, transporting, and applying water to the foundation and fill materials.

Water applied to the foundation and fill materials will be measured and payment will be made as specified in Construction Specification 10.

(Use with All Methods) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specifications and the construction details are:

a. Bid Item 7, Granular Borrow

1. This item shall consist of furnishing, placing, watering, and compacting all material required to construct the embankment of the roadway as shown on the typical sections and as staked in the field.
2. Granular borrow will be used in conjunction with the excavated material for filling voids in the embankment. The material will be obtained from the borrow area shown on the drawings.
3. Compaction shall be by Class A. Density of the finished fill matrix shall be 95% of maximum density obtained from a modified proctor test, AAHSTO T180, method C.
4. Moisture content of the material at the time of compaction, shall be within 2% of optimum. The initial water shall be applied in the borrow area. A water truck will be required at project site to obtain optimum moisture conditions.
5. Contractor shall be responsible for watering haul roads and working areas to avoid dust problems.
6. Contractor shall be responsible for maintaining drainage ditches which run parallel and transverse to the construction.
7. Water will not be paid for as a separate item, but will be subsidiary to this item.
8. Measurement will be made by truck load count and converted to cubic yards using 15% shrink. A typical truck load will be dumped at a location where measurements can be made of the dumped material. The load will be chosen by the Engineer and measured by the Contractor and the Engineer. Payment will be made in accordance with the price per cubic yard as listed on the bid schedule. Such payment will constitute full compensation for all labor, equipment, and materials necessary to complete this item.

b. Bid Item 11, Untreated Base Course, 1-inch Max.

1. This item shall consist of furnishing and installing the 1-inch base course, composed of natural gravel or crushed rock, placed on a prepared subgrade to the lines and grades shown on the drawings or staked in the field.
2. The dry mineral aggregate shall conform to the following gradation:

1-inch Gradation

<u>Sieve Size</u>	<u>% Passing Gradation Band</u>
1-inch	100
1/2-inch	70-100
#4	41-68
#16	21-41
350	10-27
#200	4-13

Variation to the above Gradation Schedule must be approved in writing by the Engineer.

3. The base course gravel shall uniformly be mixed with water prior to compaction. Moisture content shall be within 2% of optimum prior to compaction.
4. The untreated base course shall be compacted to a density which is 95% of the maximum density obtained from a modified proctor test, AASHTO T180, Method C.
5. The aggregate shall have a percentage wear not exceeding 50% when tested in accordance with AASHTO Designation T-96. Certification that the aggregate meets this wear test will be required of the Contractor prior to his placement of the base course.
6. The Contractor shall select the borrow area and submit certification that the material meets these specifications to the Engineer for approval.
7. Measurement will be made by the volume of material in cubic yards placed according to the neat lines shown on the drawing. Payment will constitute full compensation for furnishing, watering, placing, and compacting the material in place, including all labor and equipment necessary and incidental to the work.

CONSTRUCTION SPECIFICATION

32. CONCRETE FOR MINOR STRUCTURES

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing and curing portland cement concrete as required to build the structures named in Section 24 of this specification.

2. MATERIALS

Portland Cement shall conform to the requirements of ASTM Specification C150.

Aggregates shall conform to the requirements of ASTM Specification C 33 unless otherwise specified. The grading of coarse aggregates shall be as specified in Section 24.

Water shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

Performed expansion joint filler shall conform to the requirements of ASTM Specification D 1752, Type I, Type II, or Type III.

Waterstops shall conform to the requirements of ASTM Specifications A 162 for metal waterstops.

3. CLASS OF CONCRETE

Concrete for minor structures shall be classified as follows:

<u>Class of Concrete</u>	<u>Maximum Net Water Content (Gallons/bag)</u>	<u>Minimum Cement Content (Bags/cu.yd)</u>
4000	6	6 1/2

4. AIR CONTENT AND CONSISTENCY

Unless otherwise specified, the slump shall be 2 to 4 inches. If air entrainment is specified, the air content by volume shall be 5 to 8 percent of the volume of the concrete. When specified or when directed by the Engineer, a water-reducing, set-retarding admixture approved by the Engineer shall be used.

5. DESIGN OF THE CONCRETE MIX

The proportions of the aggregates shall be such as to produce a concrete mixture that will work readily into the corners and angles of the forms and around reinforcement when consolidated, but will not segregate or exude free water during consolidation.

Five days prior to placement of concrete, the Contractor shall furnish the Engineer, for approval, a statement of the materials and mix proportions (including admixtures, if any) he intends to use. The statement shall include evidence satisfactory to the Engineer that the materials and proportions will produce a consistency and strength of concrete conforming to this specification. Certification of concrete cylinder breaks will be required with each job mix submittal. The materials and proportions so stated shall constitute the "job mix". After a job mix has been approved, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer. If such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has approved a revised job mix.

6. INSPECTION AND TESTING

The Engineer shall have free entry to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the Engineer to inspect materials, equipment and processes and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with manufacturer and delivery of the concrete.

7. HANDLING AND MEASUREMENT OF MATERIALS

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and insure accurate proportioning of the ingredients of the mix.

Cement shall be measured by weight or in bags. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be required saturated, surface-dry weight plus the weight of surface moisture it contains.

Water shall be measured, by volume or by weight, to an accuracy within one percent of the total quantity of water required for the batch.

Admixtures shall be measured within a limit of accuracy of three percent.

8. MIXERS AND MIXING

Concrete shall be uniform and thoroughly mixed when delivered to the work. Variations in slump or more than 1-inch within a batch will be considered evidence of inadequate mixing and shall be corrected by increasing mixing time or other means.

For stationary mixers, the mixing time after all cement and aggregates are in the mixer drum shall be not less than 1 1/2 minutes. When concrete is mixed in a truck mixer, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 nor more than 100.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point.

9. FORMS

Forms shall be of wood, plywood, steel or other approved materials and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities. Forms shall be coated with a nonstraining form oil before being set into place.

Metal ties or anchorages within the forms shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least one-inch without injury to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones.

All edges that will be exposed to view when the structure is complete shall be chamfered, unless finished with molding tools as specified in Section 18.

10. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sand blasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth or uncompacted fill or frozen subgrade will not be permitted.

Unless otherwise specified, when concrete is to be placed over drain fill, the contract surface of the drain fill shall be covered with a layer of asphalt-impregnated building paper or polyvinyl sheeting prior to placement of concrete. Forms for weepholes shall extend through this layer into the drain fill.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weepholes in walls or slabs shall be formed with nonferrous materials.

11. CONVEYING

Concrete shall be delivered to the site and discharged into the forms within 1 1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. The Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the additional of an approved set retarding admixture. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall not be dropped more than five feet vertically unless suitable equipment is used to prevent segregation.

12. PLACING

Concrete shall not be placed until the subgrade, forms and steel reinforcement have been inspected and approved. No concrete shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time he intends to place concrete. Such notice shall be far enough in advance to give the Engineer adequate time to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications before concrete is delivered for placing.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. Unless otherwise specified, slab concrete shall be placed to design thickness in one continuous layer. Formed concrete shall be placed in horizontal layers not more than 20-inches thick. Hoppers and chutes, pipes or "elephant trunks" shall be used as necessary to prevent splashing of mortar on the forms and reinforcing steel above the layer being placed.

Immediately after the concrete is placed in the forms, it shall be consolidated by spading, hand tamping or vibration as necessary to insure smooth surfaces and dense concrete. Each layer shall be consolidated to insure monolithic bond with the preceding layer.

13. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid item 9, Concrete Pavement

1. This item shall consist of excavation, forming, placing, and curing all concrete necessary to construct the truck turnaround as shown on the drawings.
2. The concrete shall be made with Type II cement. The mix shall contain 7 bags cement per cubic yard and not more than 6 gallons of water per bag of cement.
3. The slump shall not exceed 3 1/2 inches. Contractor shall not place concrete which exceeds this slump.
4. Air entrainment shall be required. Air content by volume shall be 5 to 8 percent.
5. Construction joints will be prepared in accordance with Method 2.
6. Concrete shall be placed and consolidated in 12 foot by 12 foot squares, or scored by concrete saw on 10 foot C.C.
7. One mat of #5 reinforcing bar on 12" C.C. both ways, will be required as shown on the drawings.
8. Concrete will be placed prior to the asphalt placement to insure vertical edges at the contact zone.
9. The concrete shall be placed between June 29 and July 13. Adequate lead time will be necessary to insure that all work on the haul road is complete by July 13.
10. The concrete shall receive a heavy broom finish.
11. Measurement and payment will be by the square yard of concrete placed in accordance with these specifications and shall include the concrete, reinforcing steel, excavation, and backfill in accordance with the drawings and these specifications.

CONSTRUCTION SPECIFICATION
61. LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock for loose rock riprap shall conform to the requirements of Material Specification 523 or, if so specified shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

At least 30 days prior to delivery of rock from other than designated sources, the Contractor shall designate in writing the source from which he intends to obtain the rock and information satisfactory to the Contracting Officer that the material meets the requirements of the contract. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in Section 9 of this specification.

Rock from designated sources shall be excavated, selected and processed as necessary to meet the quality and grading requirements in Section 9 of this specification. The rock shall conform to the specified grading limits when installed in the riprap.

Filter or bedding materials when required, shall, unless otherwise specified, conform to the requirements of Material Specification 521.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding course is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

Riprap shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by the Engineer.

4. EQUIPMENT-PLACED ROCK RIPRAP

The rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full course thickness in one operation and in such manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent works.

5. HAND-PLACED RIPRAP

The rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

6. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

7. TESTING

The Engineer will perform such tests as are required to verify that the riprap, filter, and bedding materials and the completed work meet the requirements of the specifications. These tests are not intended to provide the Contractor with the information he needs to assure that the materials and workmanship meet the requirements of the specifications, and their performance will not relieve the Contractor of the responsibility of performing his own tests for that purpose.

8. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the volume of each type of riprap, including filter layers and bedding, will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional areas. Payment for each type of riprap, including filter layers and bedding, will be made at the contract unit price for that type of

riprap. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

Method 2 For items of work for which specific unit prices are established in the contract, the volume of each type of riprap and the volume of each type of filter layer or bedding will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

Method 3 For items of work for which specific unit prices are established in the contract, the quantity of each type of riprap placed within the specified limits will be measured to the nearest ton by actual weight, and the volume of each type of filter layer or bedding will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional areas. For each load of rock placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton, of rock in the load.

Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

Method 4 For items of work for which specific unit prices are established in the contract, the quantity of each type of riprap placed within the specified limits will be measured to the nearest ton by actual weight, and the volume of each type of filter material or bedding delivered and placed within the specified limits will be measured to the nearest cubic yard by measurement of the hauling equipment. For each load of material placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton, of rock in the load; or the volume, to the nearest 0.1 cubic yard, of filter material or bedding in the load.

Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be

considered full compensation for all labor, materials, equipment and all other items necessary and incidental to completion of the riprap, filter layers and bedding.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the item to which they are made subsidiary are identified in Section 9 of the specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 13, Loose Rock Wall

1. This item shall consist of furnishing and placing the required rock wall to the lines and grades as shown on the drawings.
2. Placement of rock shall be by equipment as directed by the Engineer.
3. Rock shall be obtained at the site and near station 43+50 along the Genwall Road.
4. The maximum size rock shall be 48". Minimum rock size shall be 24-inches.
5. At least 25 percent of the rocks in the front and rear faces of the wall shall be uniformly distributed header stones, each having a length at least 2-1/2 times its width. All header stones shall be laid with greatest dimension extending into the wall (at right angle to trail centerline), except at corners. At corners, alternating courses shall contain headers laid with greatest dimension parallel with wall.

The exposed face of each rock shall be parallel to the face of the wall in which it is set.

Each rock placed shall be stable on the course that supports it and shall be so handled as to not break, jar, or displace rocks already set.

Large rocks shall be used in the bottom course. Voids shall be filled with small stones, rock fragments, or fine aggregate.

6. Measurement and payment shall be in accordance with Section 8 of this specification.

b. Bid Item 10, Ditch Rip-Rap

1. This item shall consist of furnishing and placing the required rock wall to the lines and grades as shown on the drawings.
2. Placement of rock will be by Hand as directed by the Engineer.
3. Rock will be supplied by the Contractor.
4. The maximum size rock will be 9"; minimum rock size 2".
5. Measurement and payment shall be in accordance with Section 8 of this specification.

CONSTRUCTION SPECIFICATIONS

62 - WIRE BASKET GABIONS

1. SCOPE

The work will consist of furnishing and installing the gabion baskets filled with rock to the line and grades as shown on the drawings.

2. DESIGN

Gabions shall consist of uniform hexagonal wire mesh woven in a triple twist pattern with opening 8 X 10 Type (3 1/4" X 4 1/2" approx.), fabricated in such a manner as to be non-ravelling and designed to provide the required flexibility and strength.

The perimeter edges of the twisted wire mesh shall be woven around a reinforcing wire in a manner designed to prevent slippage and the edge of the mesh shall be securely selvedged. All corners shall be reinforced by heavier wire.

3. MATERIALS

Wire shall conform to the following requirements in accordance with QQW-461-G Class 3, Finish 5-Soft.

Wire for Fabric (diam.).....3.00 mm.
(.1181") \pm 2 1/2%

Wire for selvedges and corners (diam.).....3.90 mm.
(.1535") \pm 2 1/2%

Wire for binding and connecting (diam.).....2.20 mm.
(.0866") \pm 2 1/2%

Tensile Strength (P.S.I.).....60.000 -
75.000

Elongation (per cent) - not less than.....12%

Weight of Zinc Coating for all wire.....(oz./sq.ft.).80

Tensile strength and elongation shall be measured before fabrication of the netting.

Gabions shall be manufactured by Maccaferri Bekairt, or approved equal.

4. FABRICATION

Gabions shall be so fabricated that the sides, ends, lid, base, and diaphragms can be readily assembled at the construction site into rectangular baskets of the specified

sizes. Where the length of the gabion exceeds on and one half time its horizontal width. Diaphragms shall be secured in the proper position on the base section such that no additional typing will be required at this juncture.

5. DIMENSIONS AND TOLERANCES

All dimensions are subject to tolerance limit of ± 5 per cent, except the length of the gabion which is subject to a tolerance of ± 3 percent.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

a. Bid Item 8, Wire Basket Gabions

1. This item shall consist of furnishing and placing the wire basket gabions, wire basket stabilizer, furnishing and placing the rock as shown on the drawings.
2. Gabions shall be installed to lines and grades and as directed by the Engineer as follows:
 - a. Unfold individual gabion. Flatten out bottom on a hard surface.
 - b. Fold up ends, sides and diaphragms and tie together at top.
 - c. Secure the designated binding wire at the top corners of the panels. Lace the edges with alternating single and double loops no more than 4-inches between them. This includes sides of diaphragms.
 - d. Place gabion in place and stretch to take out any kinks and to bring to proper size.
 - e. Filling will be with 4-inch to 6-inch rock. Any practical filling equipment which does not damage the gabion may be used. Some manual stone adjustment during the filling operation is required to prevent undue voids.

Gabions which are 1-foot high will be filled in one layer with no connecting or bracing wires.

Gabions which are 1-foot 6-inches high will be filled 1/2 full; then connecting, or bracing wires will be tied across the gabion before the filling is completed.

Gabions 3-feet 0-inches high shall be filled as above but in three equal lifts with connecting or bracing wires between lifts.

Connecting wires shall be placed at right angles across each cell between lifts, complete filling, close tops and lace around sides and along tops of diaphragms as in Step 3 above.

Subsequent gabions shall be placed adjacent to existing filled ones. They shall be securely laced and joined to existing gabions by the lacing procedure in Step 3. The unfilled gabions shall then be stretched and filled as outlined above.

3. Only materials specified shall be used in this project. No substitute wire or other materials will be allowed.
4. All steel wire used in the gabions and wire fabric will be galvanized with a zinc coating exceeding Federal Specification requirements (QQ-W-461_G, Class 3) steelwire diameter for binding the units together will not be less than (U.S. Gage No. 11), for corners and selvages (U.S. Gage No. 9).
5. Wire Baskets will be cut and molded to conform to the lines and grades as shown on the drawings.
6. Rock fill material for Gabion, shall consist of hard durable rock between 4-inches and 8-inches in diameter. Material source will be approved by the Engineer.
7. Wire Fabric stabilizer will be laced to the gabions and covered with embankment as shown on the drawings, and shall be manufactured the same as the wire baskets described above.
8. The wire fabric shall be covered with granular fill compacted in a maximum of 12-inch horizontal layers to the requirements of Bid Item 7.
9. One hundred ten (110) feet of 24" CMP and one end section as shown on the drawings is required and payed for under this bid Item.
10. Measurement and Payment will be made as follows:
 - a. The quantity will be calculated by the capacity of the filled gabions in place.
 - b. The accepted quantities for this item will be paid for at the contract unit price per cubic yard. Such payment will constitute full compensation for furnishing and placing of materials, and all other items necessary and incidental to the completion of the work.

b. BID ITEM 12 - HILFIKER WELDED WIRE WALL

1. This item shall consist of furnishing and installing the Hilfiker welded wire fabric to the lines and grades shown on the plans.
2. Permissible backfill material shall be classified as GW to SC in conformance with ASTM designation D2487. Material shall be compacted to 90% in conformance with ASTM method D-698. Use of other backfill material requires special design considerations.
3. Design data: unit weight of backfill = 120 pcf. Internal friction angle of backfill = 30 deg. For 2 S+T loading and equivalent fluid pressure from native material of 40 pcf and 2 foot equivalent soil live load are used. For 2:1 sloping fill an equivalent fluid pressure from native material of 40 pcf is used with maximum height of slope above top of wall limited to 100% of wall height. For 1.5:1 sloping fill an equivalent fluid pressure from native material of 40 pcf is used with maximum height of slope above top of wall limited to 75% of wall height.
4. Material for the Hilfiker Welded Wire Walls shall be as specified by the Hilfiker Company. The Contractor will be required to assemble and backfill the welded wire wall in accordance with the Hilfiker's recommendation. All wire and welded wire fabric shall conform to ASTM A-82 and ASTM A-185. Fabric for the Welded Wire Wall shall be galvanized.
5. Toe bury depth: minimum 1'6" to maximum wall height of 12' and 3'0" for wall height greater than 12'.
6. Mat dimensions may be adjusted to specific site geometric constraints.
7. Measurement and payment will be at the lump sum unit price shown on the bid schedule. Payment will constitute full compensation for furnishing and installing the wire wall complete in place including all equipment, labor, and incidental items necessary to complete the work.

CONSTRUCTION SPECIFICATION

627. Flagging and Pilot Car Operation

1. SCOPE

These items shall consist of furnishing flagmen and pilot cars as directed to facilitate the safe control of traffic over highways under construction at such locations as required and directed by the Engineer.

2. FLAGGING

Flagging under this item shall be performed by certified and adequately equipped flagmen. All flagging shall be done as described in the current Department of Safety Rules and the Safety orders covering flagmen of the Industrial Commission of Utah.

3. PILOT CARS

Pilot cars shall be operated in such a manner as to safely conduct traffic over portions of the highway under construction. The cars shall be easily identified by carrying flags or other approved methods.

4. METHOD OF MEASUREMENT

- a. Flagging shall be measured by the man hour of authorized flagging.
- b. Pilot car operation shall be measured by the hour of Pilot Car operation full operated.
- c. If the Contractor elects to use methods requiring flagging or pilot car operation in excess of that authorized by the Engineer, the excess amount shall be at the Contractor's expense.
- d. Flagging is authorized at the recognized approach between the materials site and the public highway. Materials sites may be contractor furnished or department optioned. This provision does not apply at commercial site wherein other agencies or the general public are obtaining materials. Payment shall not be made for flagging at other locations between the materials site and the project.

5. BASIS OF PAYMENT

- a. Flagging shall be paid for at the fixed unit price per hour for "Flagging" as determined by the State, which price shall be full compensation for all work necessary to complete this item. Increases or decreases of more than 5 percent in the estimated quantities for this item shall not be cause for adjustment of the prescribed price. No payment shall be made for flagging which is used after expiration of the specified contract time and any approved extensions thereof.
- b. Pilot car operation shall be paid for at the contract unit price per hour for "Pilot Car Operation" which price shall be full compensation for all work necessary to complete the item.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 6, Flagging

1. This item shall consist of furnishing the certified flagging as required to complete the work in accordance with these specifications.
2. Payment for Flagging shall be paid for at the fixed unit price per hour. Such payment will constitute full compensation and all other items necessary and incidental to the performance of the work.

Appendix 3-19

Storage Pad Stability Analysis

STORAGE PAD SLOPE STABILITY ANALYSIS
AT THE CRANDALL CANYON MINE,
EMERY COUNTY, UTAH

Prepared for

GENWAL COAL COMPANY
Crandall Canyon Mine
Huntington, Utah

Prepared by

EARTHFAX ENGINEERING, INC.
Midvale, Utah

November 9, 1990



TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1-1
2.0 BACKGROUND INFORMATION	2-1
2.1 Site Description	2-1
2.2 General Seismicity	2-2
3.0 SOILS INFORMATION	3-1
3.1 General	3-1
3.2 Subsurface Exploration	3-1
3.3 Laboratory Analyses	3-2
3.4 Soil Data	3-2
4.0 SLOPE STABILITY ANALYSES	4-1
4.1 General	4-1
4.2 Assumptions	4-1
4.3 Soil Property Parameters	4-1
4.4 Slope Stability Analysis	4-2
5.0 CONCLUSIONS AND RECOMMENDATIONS	5-1
6.0 REFERENCES	6-1

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1-1 Site Location Map	1-2
1-2 Genwal Site Plan, Soil Sampling and Cross Section Locations	1-3
2-1 Utah Earthquakes of Magnitude 4.0 (Richter) or Greater - 1850 to 1978	2-3
4-1 Storage Pad Cross Section	4-3

LIST OF TABLES

<u>Table</u>	<u>Page</u>
3-1 Summary of Laboratory Test Results	3-3

LIST OF APPENDICES

APPENDIX A	Soils Laboratory Test Results
APPENDIX B	Slope Stability Analysis Under Static Conditions - Computer Output
APPENDIX C	Slope Stability Analysis Under Dynamic Conditions - Computer Output

STORAGE PAD SLOPE STABILITY ANALYSIS
AT THE CRANDALL CANYON MINE,
EMERY COUNTY, UTAH

1.0 INTRODUCTION

The Crandall Coal Mine, owned by Genwal Coal Company near Huntington, Utah (Figure 1-1), currently trucks approximately 1,000,000 tons of coal annually down Crandall Canyon. This stream-incised canyon provides only limited area for structures, storing equipment, and maneuvering vehicles (Figure 1-2).

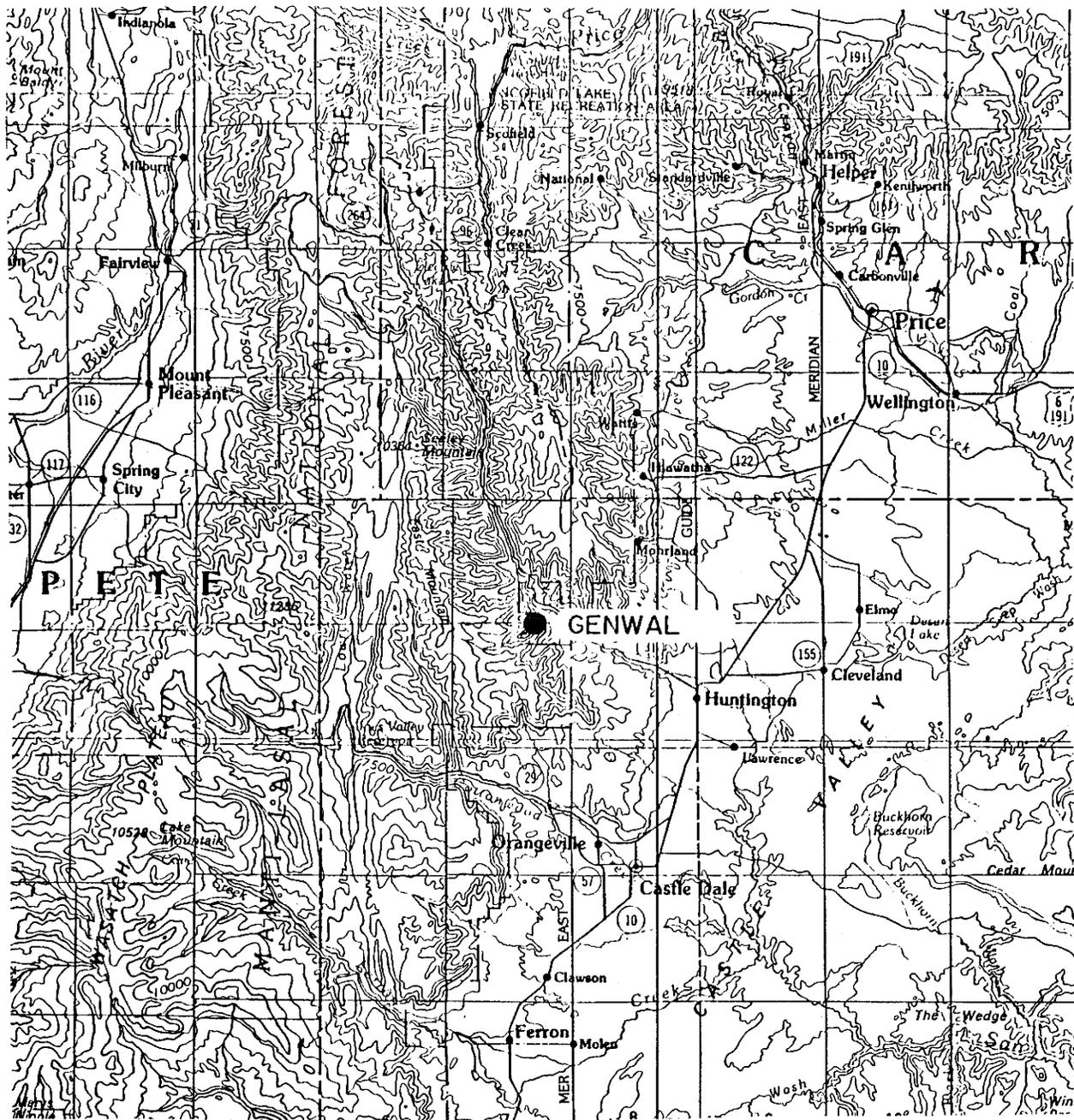
To provide additional surface area for equipment storage and vehicle maneuvering, Genwal has proposed extending their existing storage pad toward Crandall Creek. In addition, Genwal has proposed paving their haul road from the mouth of Crandall Canyon to the truck turnaround area, a distance of approximately 1.3 miles. The truck turnaround area is shown on Figure 1-2.

The purpose of this report is to determine the slope stability of the proposed storage pad. Slope stability analyses will be evaluated for the critical operating conditions and will include an allowance for seismic loading.

The work described in and associated with this report included field observations, surface soil sample collection, reviews of field and laboratory data, and geotechnical calculations.

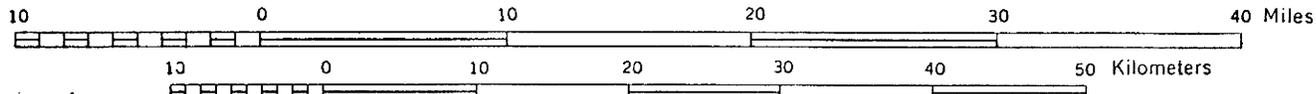
This report presents an expression of professional opinions and recommendations based on the results of field observations, laboratory analyses, and professional judgement. A qualified engineer or geologist should be at the site during the storage pad construction to monitor field conditions and make field decisions as necessary.

This document is divided into six sections including this introduction. Background information related to the site is summarized in Section 2.0. Results



Scale 1:500 000

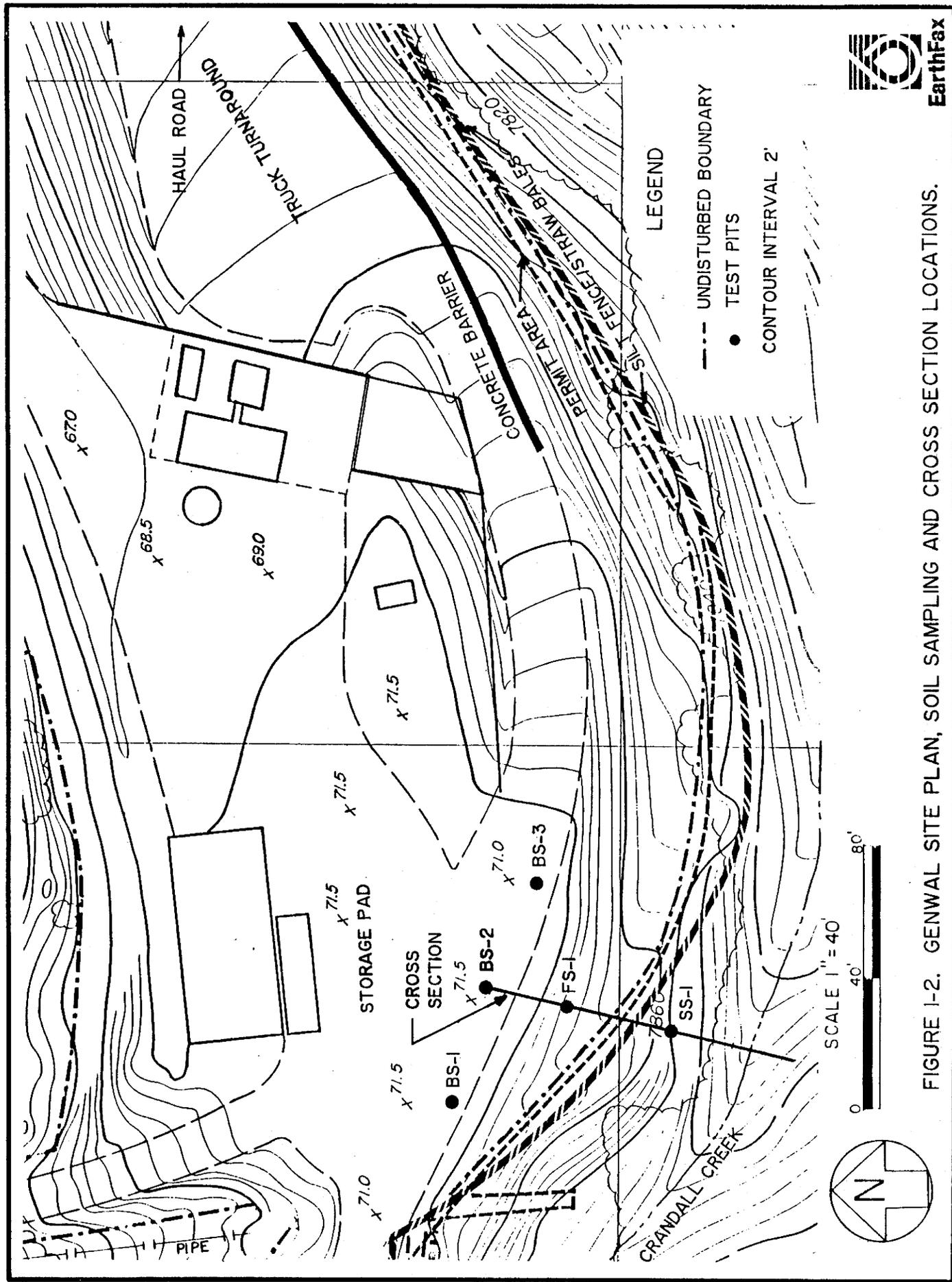
1 inch equals approximately 8 miles



Contour interval 500 feet
National Geodetic Vertical Datum of 1929

FIGURE I-I. SITE LOCATION MAP.





of the near-surface soils investigation are presented in Section 3.0, followed by a slope stability analysis of the storage pad slope in Section 4.0. Conclusions and recommendations are presented in Section 5.0, followed by the cited references in Section 6.0.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The surface storage pad for the Crandall Canyon Mine is located on the north slope of Crandall Canyon which is a tributary of Huntington Creek in Emery County, Utah. The geology of Crandall Canyon consists of the Mesaverde Group of upper Cretaceous sedimentary rocks. Genwal is currently mining the Hiawatha coal seam of the Blackhawk Formation.

The Blackhawk Formation, the middle member of the Mesaverde Group, consists of light to medium gray sandstone, light gray to black shale, light to medium gray siltstone, and coal (Davis and Doelling, 1977). The sandstones are mostly fine grained and form ledges and cliffs. The shales and siltstones are generally carbonaceous and underlie covered slopes. The sediments of the Blackhawk Formation are typically 400 to 1,100 feet thick.

Alluvial deposits are present in the bottom of Crandall Canyon and grade into colluvial deposits at short distances upslope from the canyon floor. Alluvial deposits in the vicinity of the surface storage pad are typically silty-sands with intermittent layers of sandy-gravel. Colluvial deposits contain poorly sorted, unstratified layers of large angular sandstone blocks in a gravelly sand matrix.

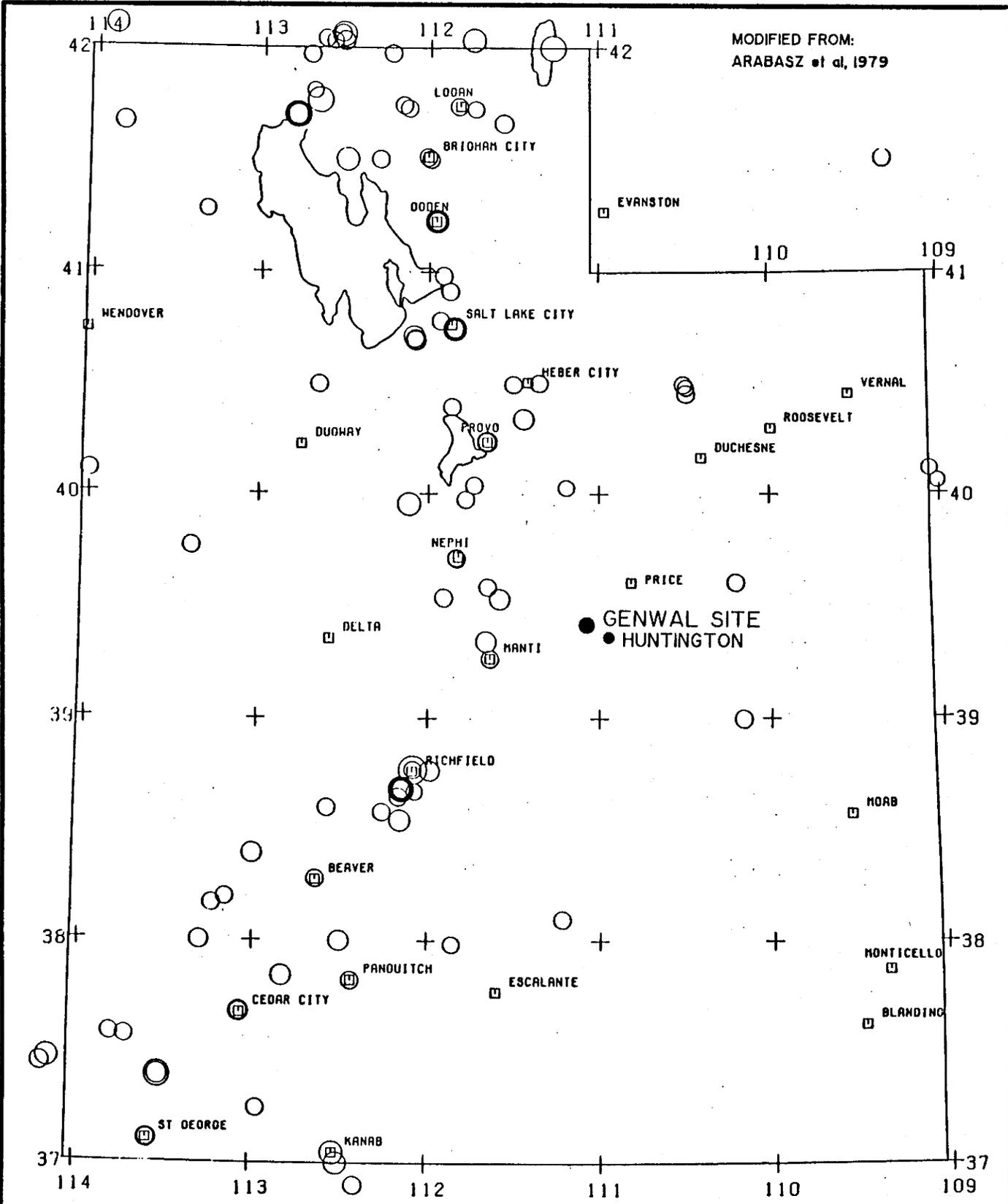
The north bank of the Crandall Creek stream channel downslope from the surface storage pad consists of nearly vertical stream cuts which are currently up to 8 feet high with a debris slope at the base of the cut. Alluvial deposits of cemented silty-sands and sandy-gravels are exposed in the steep bank cut.

The vegetation on the south slope of Crandall Canyon consists of dense stands of conifers and aspen. These trees are present in scattered stands on the north slope along with bushes, sagebrush, and grasses.

2.2 General Seismicity

Seismic activity in the vicinity of the Crandall Creek Mine has been historically low. Between 1850 and 1978, the largest seismic event to occur near the site was Magnitude 5.8 (Richter scale) at a hypocentral distance of approximately 26 miles west (Figure 2-1; Arabasz et al, 1979). According to worldwide earthquake data compiled by Seed (1982), this event corresponds to a peak horizontal acceleration in rock of about 0.07g, where g is gravitational acceleration. This peak horizontal acceleration will be used for the slope stability analyses.

MODIFIED FROM:
ARABASZ et al, 1979



1850 - JUNE 1978, MAG 4.0 (INT V) OR GREATER

MAGNITUDE SCALE (ML):

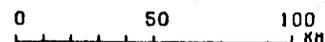


FIGURE 2-1. UTAH EARTHQUAKES OF MAGNITUDE 4.0 (RICHTER) OR GREATER - 1850 TO 1978.



3.0 SOILS INFORMATION

3.1 General

Calcium carbonate from the parent rock has cemented the insitu alluvial and colluvial soils. This cementation, coupled with inherent slope stability provided by roots and capillarity (inter-particle moisture), enables steep slopes to form in Crandall Canyon. Depending on the relative influence of these factors and the localized geomorphic processes, the side slopes in Crandall Canyon range from the angle of repose at the ridge line to near vertical at locations along the creek. Upon saturation, apparent and bonded soil strength from capillarity and cementation decreases, leaving root structure and internal friction/cohesion to maintain the slope.

3.2 Subsurface Exploration

The site of the proposed storage pad extension was investigated by hand excavating five shallow test pits on September 20, 1990 at locations identified as BS-1 through BS-3, FS-1, and SS-1 in Figure 1-2. Bulk grab samples were collected from each location and submitted for physical analyses.

Samples BS-1 through BS-3 were collected from the existing surface storage pad. This storage pad is constructed of native fill material (silts through cobbles) underlying imported road base (silty gravelly sand). These soils are very hard due to repeated loading with truck traffic and to annual applications of magnesium chloride. Concrete was encountered at a depth of 4 inches at BS-1, thereby precluding deeper excavation. BS-2 and BS-3 were both excavated to a depth of about 18 inches. Based on these two pits, the base course material extends to a depth of approximately 8 inches. According to telephone conversations with Genwal, this thickness is typical for the haul road.

The sample from BS-1 consists of road base. Samples from BS-2 and BS-3 are composite samples of road base and native fill material.

Sample FS-1 was collected from the fill slope of the surface storage pad. This material is uncompacted silty gravelly sand and appears to be a composite of road base and native fill material.

Sample SS-1 was collected from native soil along the north bank of Crandall Creek. This material is a silty gravelly sand with calcium carbonate cementation.

3.3 Laboratory Analyses

Soil samples collected during the field investigation were submitted to Garco Testing Laboratory in Salt Lake City, Utah for physical analyses. Laboratory tests were performed in accordance with methods prescribed by the American Society of Testing and Materials.

Modified Proctor compaction tests were conducted on one composite sample from pits BS-1 through BS-3. Atterberg Limits and mechanical gradation tests were conducted on samples from SS-1 and a composite of BS-1 through BS-3. Garco submitted samples from SS-1 and FS-1 to Dames & Moore in Salt Lake City, Utah for unconsolidated, undrained direct shear tests to evaluate soil strength parameters. These laboratory results are presented in Appendix A.

Three California Bearing Ratio (CBR) tests were conducted on samples from BS-1 through BS-3 compacted to 95% of the modified Proctor dry density. These test results are presented in a haul road design report by EarthFax (1990).

3.4 Soil Data

Laboratory test results of the site soils are summarized in Table 3-1. According to these data, the soils are nonplastic silty gravelly sands and silty

TABLE 3-1

Summary of Laboratory Test Results

Sample	Unified Soil Class ^(a)	Plastic Index	Percent Passing #4 sieve	Percent Passing #200 Sieve	Internal Friction and Cohesion (°/ksf)	Modified Proctor Density/Moisture
BS-1	SM	Nonplastic	56.4	19.9		132.8pcf 6.9%
BS-2	GM	Combined Sample	Combined Sample	Combined Sample		132.8pcf 6.9% Combined Sample
BS-3	GM					
FS-1	SM				55/1.6 ^(b)	
SS-1	SM	Nonplastic	71.0	19.8	46/0.7 ^(c)	

- (a) All samples are coarse-grained with greater than 12% passing a #200 sieve, thereby rendering an SM or GM classification. BS-1, FS-1, and SS-1 are silty gravelly sands. BS-2 and BS-3 are silty sandy gravels.
- (b) Sample compacted to 123.5 pcf and tested under unsaturated and undrained conditions.
- (c) Sample compacted to 110 pcf and tested under unsaturated and undrained conditions.

sandy gravels. Typically, 19.8% of the soil is fine-grained (passing a #200 sieve). Since the samples are nonplastic, the fine-grained fraction is probably silt rather than clay. The modified Proctor density of the base course material is 132.8 pounds per cubic foot (pcf) at an optimum moisture content of 6.9%.

The angle of internal friction as determined by the direct shear test is 46 degrees for sample SS-1 and 55 degrees for sample FS-1. The internal cohesion is 700 pounds per square foot (psf) for sample SS-1 and 1600 psf for sample FS-1. These values are unusually high and, in the case of sample FS-1, may indicate that gravel-sized particles had a significant effect on the limited testing surface of the direct shear device. The high strength values for sample SS-1 may explain the prolonged stability of the near-vertical stream cut downslope of the storage pad on the north bank of Crandall Creek. The strength parameters from sample SS-1 will be used to conduct the slope stability analyses.

4.0 SLOPE STABILITY ANALYSES

4.1 General

Soil slope stability analyses were performed with the computer program GEOSLOPE which is based on the FORTRAN program STABL3, developed at Purdue University. GEOSLOPE utilizes the limit equilibrium procedure of slices to determine the safety factor of potential failure surfaces for circular (Simplified Bishop's method) and noncircular shapes (Jambu's method). Potential failure surfaces at the site were assumed to be circular for this report.

4.2 Assumptions

The following assumptions were made for the slope stability analyses:

1. Results from the direct shear test on sample SS-1 are representative soil strength parameters for the native soil. Therefore, angle of internal friction is 46 degrees and the internal cohesion is 700 psf.
2. The soils drain rapidly and excess pore pressures do not develop in response to strains and stress changes. Consequently, the pore pressure parameter in the stability analysis is 0.
3. The maximum horizontal acceleration at the site is 0.07g.

4.3 Soil Property Parameters

As indicated in Section 3.1, the shear strength of insitu soil deposits at Genwal is provided by internal friction and cohesion, root/soil interaction, calcium carbonate cementation, and inter-particle capillarity. The latter two components disappear upon saturation. The shear strength of disturbed native soil deposits is developed through internal friction and cohesion, capillarity and, to lesser degrees, cementation and root/soil interaction. Internal friction, cohesion, and capillarity act on imported soils.

Data for shear strength components provided by cementation, capillarity, and vegetation are not available. These strengths can be estimated, however, by conducting slope stability analyses on the existing slope and assuming a minimum safety factor under dry, static (no earthquake loading) conditions. In the interest of conservatism, however, these shear strength components will be neglected and the stability will be evaluated using only internal friction and cohesion.

4.4 Slope Stability Analysis

A cross-section of the Crandall Canyon and storage pad slope is presented in Figure 4-1. This cross-section was developed by surveying the slope using a hand-held eye level and a measuring tape. The proposed storage pad extension is also shown in Figure 4-1. Boulders will be placed at the toe of the extension slope to act as a makeshift retaining wall, thereby enabling additional fill soil to be placed.

The proposed slope in Figure 4-1 is stable with a critical safety factor of 1.58 under static conditions and 1.45 under dynamic conditions using a horizontal acceleration of 0.07g. Results of the stability analyses are presented in Appendix C. As a worst-case condition, the debris slope at the base of the near-vertical stream cut was not included in the analyses since Crandall Creek may wash this debris away during a period of peak flow.

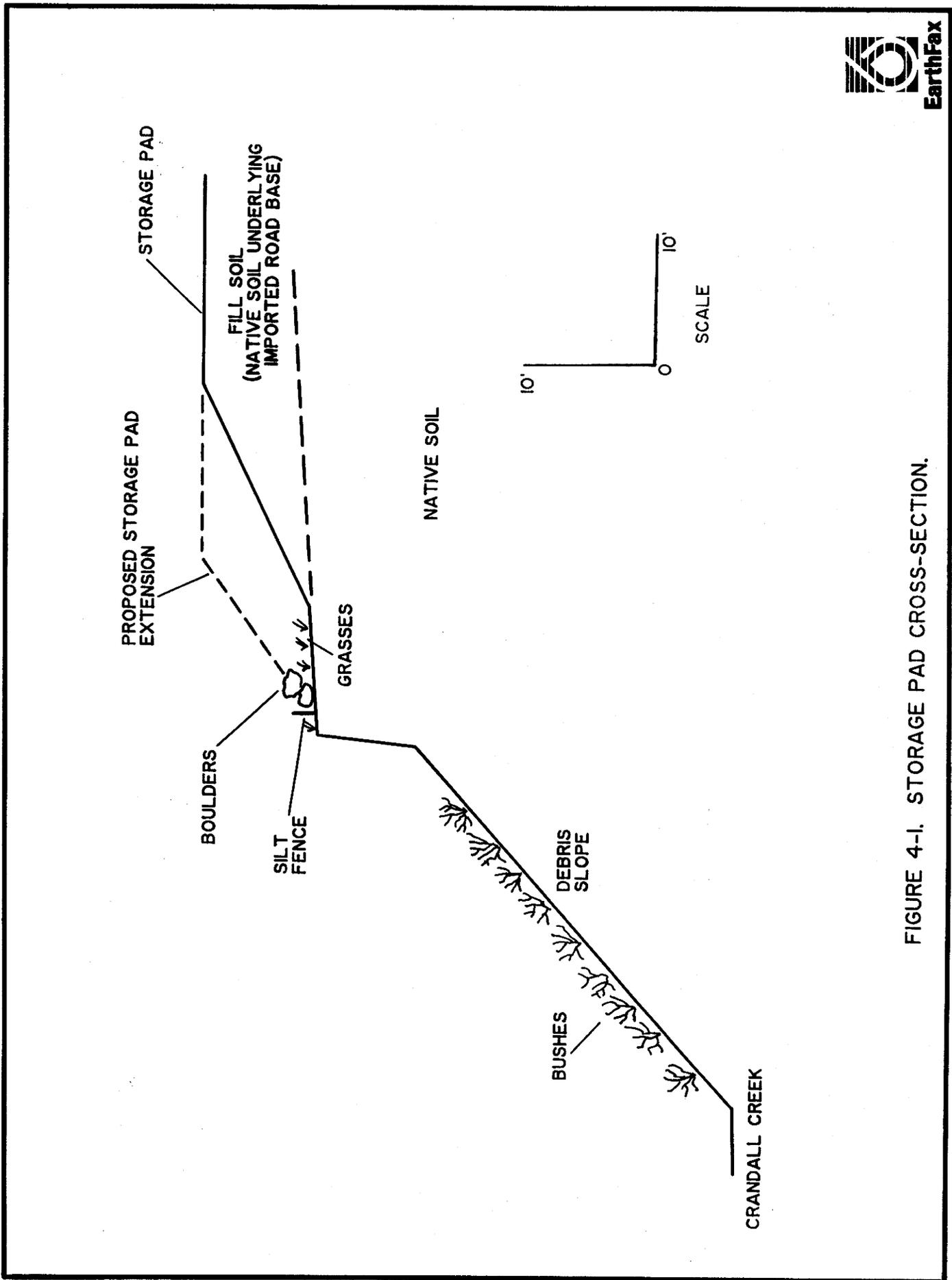


FIGURE 4-1. STORAGE PAD CROSS-SECTION.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This report represents an expression of opinions and recommendations based on field observations, laboratory analyses, and professional judgement. It is recommended that a geotechnical or geological engineer be on site during construction of the storage pad extension to allow adequate field decisions to be made regarding local conditions.

Slope stability analyses were conducted using an angle of internal friction of 46 degrees and an internal cohesion of 700 psf. In the interest of conservatism, shear strengths imparted through root/soil interaction, calcium carbonate cementation, and inter-particle capillarity were neglected. In addition, as a worst-case condition, the debris slope at the base of the near-vertical stream cut was not included in the analyses since Crandall Creek may wash this debris away during a period of peak flow. The proposed slope in Figure 4-1 is stable with a critical safety factor of 1.58 under static conditions and 1.45 under dynamic conditions using a horizontal acceleration of 0.07g.

6.0 REFERENCES

- Arabasz, W. J., R. B. Smith, and W. D. Richins (Ed.). 1979. Earthquake Studies in Utah 1850 to 1978. University of Utah Seismograph Stations, Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah.
- Davis and Doelling. 1977. Coal Drilling at Trail Mountain, North Horn Mountain, and Johns Peak Areas, Wasatch Plateau. Utah Geological and Mineral Survey Bulletin 112. Salt Lake City, Utah.
- EarthFax Engineering, Inc. 1990. Flexible Pavement Design for the Haul Road at the Crandall Canyon Mine, Emery County, Utah. Project Report Prepared for Genwal Coal Company, Huntington, Utah.
- Seed, H. B., and I. M. Idriss. 1982. Ground Motions and Soil Liquefaction during Earthquakes. Earthquake Engineering Research Institute, Berkeley, California.

Genwal Coal Company
Grandall Canyon Mine

Storage Pad Stability Analysis
November 9, 1990

APPENDIX A

Soils Laboratory Test Results



GARCO TESTING LABORATORIES

532 West 3560 South
Salt Lake City, Utah 84115
Phone 266-4498

5826 South 1900 West
Roy, Utah 84067
Phone 776-5355

5071 So. Arville
Las Vegas, Nevada 89118
Phone (702) 364-8031

October 15, 1990

Earth Fax Engineering
Attn: Rhett Brooks
7324 S. 1300 E., Ste 100
Midvale, Utah 84047

Subject: Physical Properties on samples submitted from
the Genwall project.

<u>Direct Shear Unconsolidated - Undrained</u>			
Lab #33098 - I.D.: FS-1			
Soil I.D.:	SM	Maximum Dry Density =	132.8
% Compaction:	93%	Optimum Moisture =	6.9%
Fee Angle	=	55 deg	
Cohesion	=	1600 psf	
Lab #33099 - I.D.: <u>SS-1</u> REMOLDED TO 110 pcf			
Soil I.D.:	SM	Maximum Dry Density =	132.8
% Compaction:	93%	Optimum Moisture =	6.9%
Fee Angle	=	46 deg	
Cohesion	=	700 psf	

Atterberg Limit

Lab #33101 SAMPLE SS-1

Non Plastic

ASTM D-1883 California Bearing Ratio

Lab #33092 - I.D.: BS-1

Maximum Density =	132.8	Surcharge =	50 psf
Optimum Moisture =	6.9%	% Swell =	0
% Compaction =	94.8%		

Bearing Values

<u>Penetration</u>	<u>PSI</u>	<u>% of Standard</u>
.100	485	48
.200	866	58
.300	1117	59
.400	1342	58
.500	1564	60

National Voluntary
Laboratory Accreditation
Program



United States Department
of Commerce Accredited

Member: ASTM, ACI, AGC

Lab #33093 - I.D.: BS-2

Maximum Density	=	132.8	Surcharge	=	50 psf
Optimum Moisture	=	6.9%	% Swell	=	0.53%
% Compaction	=	95.4%			

Bearing Values

<u>Penetration</u>	<u>PSI</u>	<u>% of Standard</u>
.100	216	21
.200	291	19
.300	365	19
.400	451	19
.500	539	20

Lab #33092 - I.D.: BS-3

Maximum Density	=	132.8	Surcharge	=	50 psf
Optimum Moisture	=	6.9%	% Swell	=	0
% Compaction	=	95.4%			

Bearing Values

<u>Penetration</u>	<u>PSI</u>	<u>% of Standard</u>
.100	171	17
.200	316	21
.300	420	22
.400	529	23
.500	656	25

Atterberg Limit

Lab #33096 - I.D.: Combined material BS-1, BS-2, BS-3

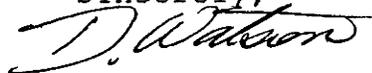
Non Plastic

ASTM D-1557-D Proctor

Lab #33095 - I.D.: Combined material BS-1, BS-2, BS-3

Maximum Density	=	132.8 pcf
Optimum Moisture	=	6.9%

Sincerely,



Doug Watson
General Manager



GARCO TESTING LABORATORIES

532 West 3560 South
Salt Lake City, Utah 84115
Phone 266-4498

5826 South 1900 West
Roy, Utah 84067
Phone 776-5355

5071 So. Arville
Las Vegas, Nevada 89118
Phone (702) 364-8031 9/28/90

0091

EARTH FAX ENGINEERING, INC.
7324 SOUTH 1300 EAST, STE 100
MIDVALE, UTAH 84047
ATTN: RANDOLPH GAINER

LAB NO.: 33100
MATERIAL: SS-1
FIT/PLANT:

PROJECT: QUALITY CONTROL TEST DATE: 9/25/90
IDENTIFICATION: SAMPLE BY: CUST RUN BY: KRIS
SPECIFICATION:
REMARKS: #33101: ATTERBERG LIMIT-NON PLASTIC

USA SIEVE NUMBER	GRAMS RETAINED	% RETAINED	ACCUM. % RETAINED	% PASSING	SPECIFICATION % PASSING
2.5"	320.0	16.4	16.4	83.6	
1.5"	0		16.4	83.6	
1"	79.0	4.0	20.4	79.6	
3/4"	17.8	.9	21.3	78.7	
1/2"	48.8	2.5	23.8	76.2	SILTY GRAVELLY SAND SM
3/8"	34.4	1.8	25.6	74.4	
#4	66.1	3.4	29.0	71.0	
#8	49.0	2.5	31.5	68.5	
#16	40.2	2.1	33.6	66.4	
#30	51.3	2.6	36.2	63.8	
#50	239.2	12.2	48.4	51.6	
#100	422.0	21.6	70.0	30.0	
#200	200.3	10.2	X 80.2	19.8	

SILTY GRAVELLY SAND
SM

ORIGINAL WT.	1255.5	F.M.	3.72
WASHED WT.	1595.4		
-#200 W.O.	360.1	DESIGN F.M.	
-#200 S.O.	26.5		
TOTAL -#200	386.6 =		19.8%

SINCERELY
D. Watson
MANAGER

National Voluntary
Laboratory Accreditation
Program



United States Department
of Commerce Accredited

Member: ASTM, ACI, AGC



GARCO TESTING LABORATORIES

532 West 3560 South
Salt Lake City, Utah 84115
Phone 266-4498

5826 South 1900 West
Roy, Utah 84067
Phone 776-5355

5071 So. Arville
Las Vegas, Nevada 89118
Phone (702) 364-8031 9/28/90

0091

EARTH FAX ENGINEERING, INC.
7324 SOUTH 1300 EAST, STE 100
MIDVALE, UTAH 84047
ATTN: RANDOLPH GAINER

LAB NO.: 33097

MATERIAL: COMBINED MATERIAL
PIT/PLANT: FROM BS-1, BS-2, AND BS-3

PROJECT: QUALITY CONTROL
IDENTIFICATION: COMB BS-1, BS-2, BS-3
SPECIFICATION:

TEST DATE: 9/25/90

SAMPLE BY: CUST RUN BY: KRIS

REMARKS: #33096:ATTERBERG LIMIT-NON PLASTIC

USA SIEVE NUMBER	GRAMS RETAINED	% RETAINED	ACCUM. % RETAINED	% PASSING	SPECIFICATION % PASSING
2"	292.1	9.4	9.4	90.6	
1.5"	274.2	8.8	18.2	81.8	
1"	42.5	1.4	19.6	80.4	
3/4"	50.0	1.6	21.2	78.8	
1/2"	241.5	7.8	29.0	71.0	
3/8"	135.6	4.4	33.4	66.6	
#4	316.6	10.2	43.6	56.4	SILTY SANDY GRAVEL
#8	220.6	7.1	50.7	49.3	GM
#16	137.8	4.4	55.1	44.9	
#30	92.4	3.0	58.1	41.9	
#50	124.6	4.0	62.1	37.9	
#100	330.9	10.6	72.7	27.3	
#200	230.5	7.4	X 80.1	19.9	

ORIGINAL WT. 3113.7
 WASHED WT. 2529.2
 -#200 W.O. 584.5
 -#200 S.O. 39.0
 TOTAL -#200 623.5 = 20.0%

F.M. 4.73
DESIGN F.M.

SINCERELY,

MANAGER

National Voluntary
Laboratory Accreditation
Program



United States Department
of Commerce Accredited

Member: ASTM, ACI, AGC

GARCO TESTING LABORATORIES

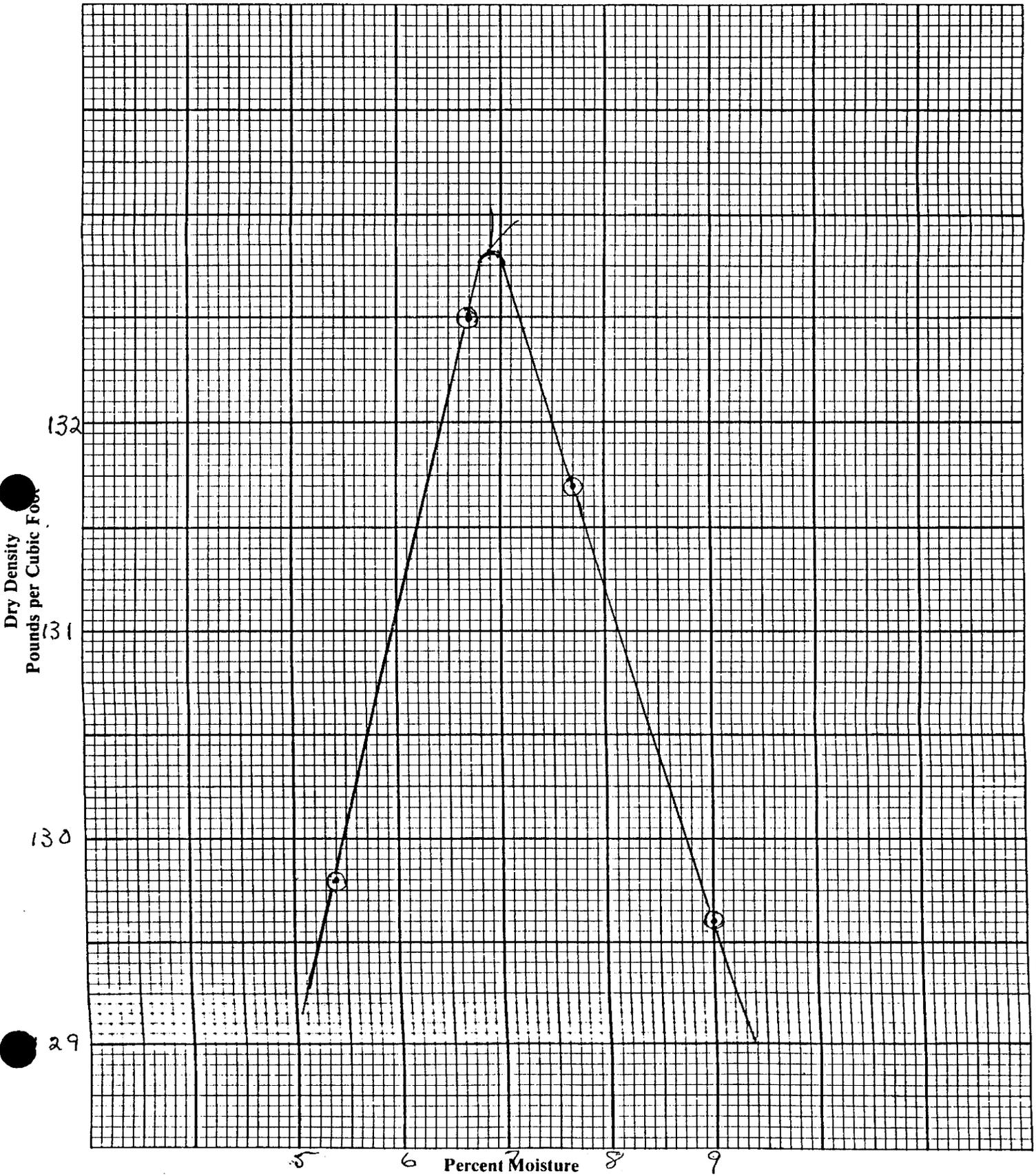
5826 South 1900 West
Roy, Utah 84067

532 West 3560 South
Salt Lake City, Utah 84115

5071 S. Arville
Las Vegas, Nevada 89118

MOISTURE DENSITY CURVE ASTM C-698, D-1557

Lab # 33095 Material _____ Source Comb. BS-1, BS-2, BS-3
Customer Earth Fax Project Gen wal Date 9-26-90
Test Method T-180-D Max. Compaction .132.8 Opt. Moist. 6.9



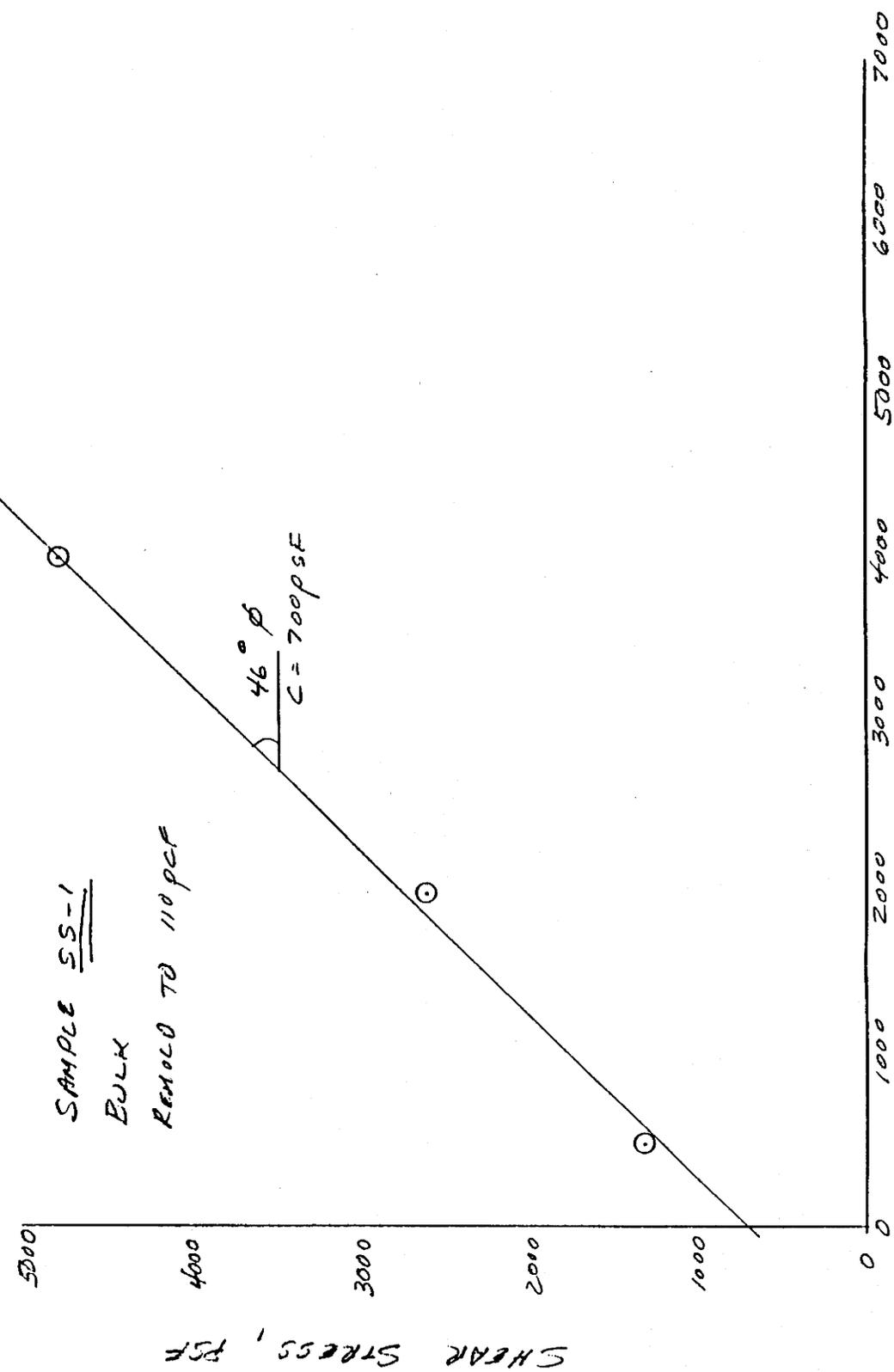
REVISIONS

BY _____ DATE _____ TO EO _____
 BY _____ DATE _____ TO EO _____

BY EED DATE 10/11/90
 CHECKED BY _____
 COPY TO EO _____

DIRECT SHEAR
 UNCONSOLIDATED - UNDRAINED

SAMPLE SS-1
 BULK
 REMOLD TO 110pcf

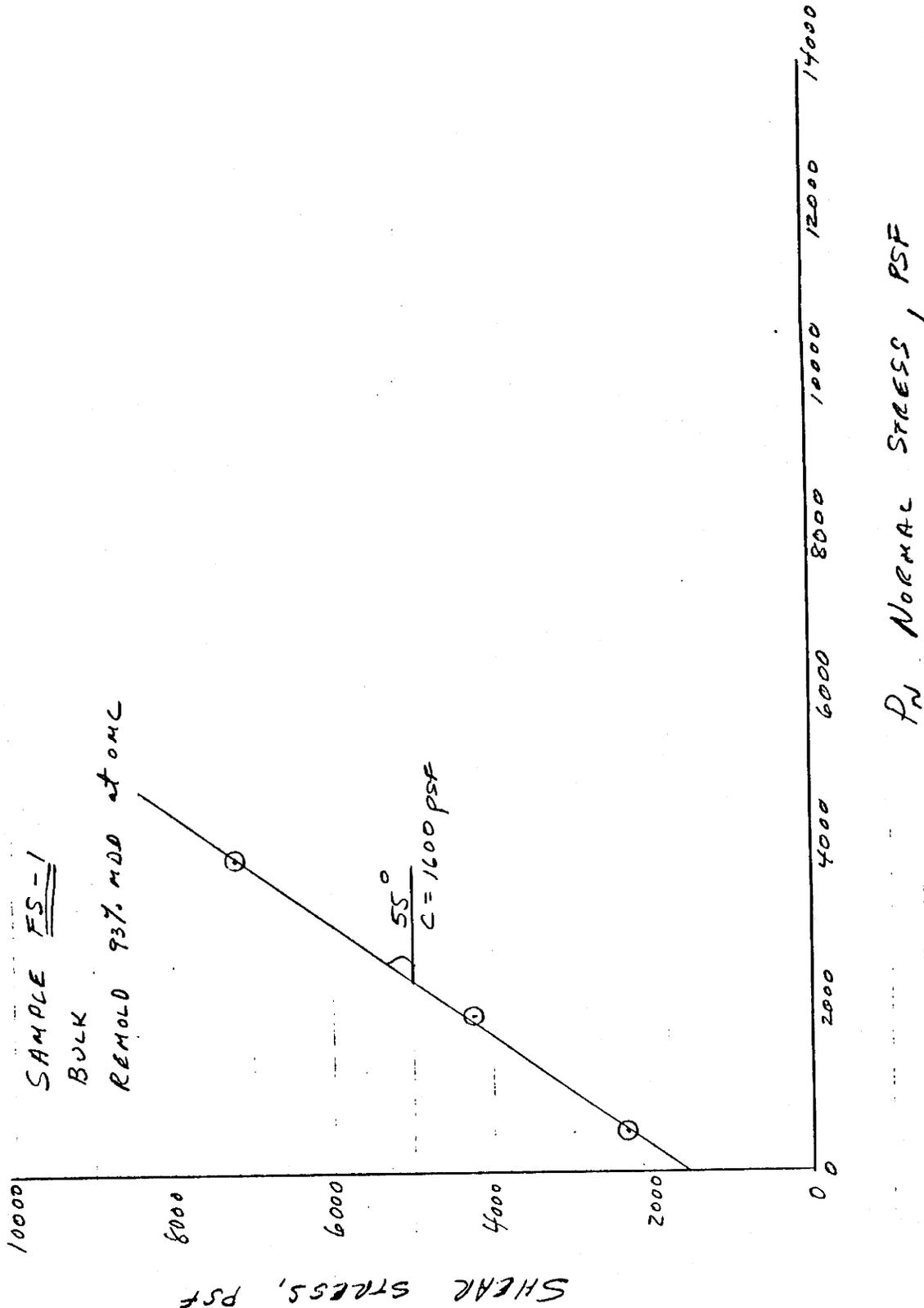


P_N NORMAL STRESS, PSF

REVISIONS
 BY _____ DATE _____ TO EO _____
 BY _____ DATE _____ TO EO _____

BY SPC DATE 10/11/90
 CHECKED BY _____
 COPY TO EO _____

DIRECT SHEAR
 UNCONSOLIDATED - UNDRAINED



Genwal Coal Company
Crandall Canyon Mine

Storage Pad Stability Analysis
November 9, 1990

APPENDIX B

Slope Stability Analysis Under Static Conditions - Computer Output

PROFIL

GENWAL - Proposed storage pad expansion with debris slope at base of slope scoured

6

6

0.0 100.0 25.0 100.0 1

25.0 100.0 50.0 102.0 1

50.0 102.0 53.3 131.7 1

53.3 131.7 55.0 131.8 1

55.0 131.8 67.0 140.4 1

67.0 140.4 150.0 140.4 1

SOIL

1

120.0 130.0 700.0 46.0 0.0 0.0 1

CIRCL2

11

10

50.0 52.0

55.0 90.0

0.0

3.0

80.0

5.0

BOUNDARY NO.	X-LEFT	Y-LEFT	X-RIGHT	Y-RIGHT	SOIL TYPE BELOW BND
1	.00	100.00	25.00	100.00	1
2	25.00	100.00	50.00	102.00	1
3	50.00	102.00	53.30	131.70	1
4	53.30	131.70	55.00	131.80	1
5	55.00	131.80	67.00	140.40	1
6	67.00	140.40	150.00	140.40	1

ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT.	SATURATED UNIT WT.	COHESION INTERCEPT	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT	PIEZOMETRIC SURFACE NO.
1	120.0	130.0	700.0	46.0	.00	.0	1

A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

110 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 11 POINTS EQUALLY SPACED ALONG THE GROUND SURFACE BETWEEN X = 50.00 AND X = 52.00

EACH SURFACE TERMINATES BETWEEN X = 55.00 AND X = 90.00

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00

3.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

RESTRICTIONS HAVE BEEN IMPOSED UPON THE ANGLE OF INITIATION. THE ANGLE HAS BEEN RESTRICTED BETWEEN THE ANGLES OF 5.0 AND 80.0 DEG.

FACTOR OF SAFETY CALCULATION HAS GONE THROUGH TEN ITERATIONS

FACTOR OF SAFETY FOR THE PRECEDING SPECIFIED SURFACE = 2.320

FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

SAFETY FACTORS ARE CALCULATED BY THE MODIFIED BISHOP METHOD.

1

EARTH FAX

Midvale, UT (s/n 5080)

FAILURE SURFACE # 1 SPECIFIED BY 17 COORDINATE POINTS

SAFETY FACTOR = 1.583

X-CENTER = -226.27

Y-CENTER = 318.27

RADIUS = 350.85

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	52.19
2	51.84	104.37	52.68
3	53.66	106.76	53.17
4	55.46	109.16	53.66
5	57.23	111.58	54.15
6	58.99	114.01	54.64
7	60.73	116.46	55.13
8	62.44	118.92	55.62
9	64.14	121.39	56.11
10	65.81	123.88	56.60
11	67.46	126.39	57.09
12	69.09	128.91	57.58
13	70.70	131.44	58.07
14	72.29	133.99	58.56
15	73.85	136.55	59.05
16	75.39	139.12	59.54
17	76.15	140.40	

SLICE NO.	X	DX	DW	DQ	DU	DN	DSr
1	50.92	1.84	1564.91	.00	.00	457.11	741.43
2	52.57	1.46	3469.14	.00	.00	2327.11	1965.03
3	53.48	.36	1083.11	.00	.00	776.80	950.61
4	54.33	1.34	3880.66	.00	.00	2749.57	2241.46
5	55.23	.46	1266.32	.00	.00	887.29	1022.91
6	56.35	1.78	4777.27	.00	.00	3312.08	2609.54

7	58.11	1.76	4477.53	.00	.00	3048.24	2436.90
8	59.86	1.74	4176.98	.00	.00	2782.24	2262.84
9	61.59	1.72	3875.97	.00	.00	2514.29	2087.51
10	63.29	1.69	3574.77	.00	.00	2244.58	1911.04
11	64.97	1.67	3273.69	.00	.00	1973.31	1733.53
12	66.40	1.19	2169.54	.00	.00	1250.00	1260.24
13	67.23	.46	794.36	.00	.00	442.35	731.77
14	68.28	1.63	2494.25	.00	.00	1263.20	1268.88
15	69.90	1.61	1973.77	.00	.00	784.25	955.48
16	71.49	1.59	1463.65	.00	.00	311.26	645.99
17	73.07	1.56	964.15	.00	.00	-155.57	340.53
18	74.62	1.54	475.51	.00	.00	-616.02	39.24
19	75.77	.75	57.98	.00	.00	-475.27	131.33

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 2 SPECIFIED BY 16 COORDINATE POINTS

SAFETY FACTOR = 1.584

X-CENTER = -13.14
Y-CENTER = 167.20
RADIUS = 89.61

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.20	103.80	45.93
2	52.29	105.96	47.85
3	54.30	108.18	49.77
4	56.24	110.47	51.69
5	58.10	112.83	53.60
6	59.88	115.24	55.52
7	61.58	117.72	57.44
8	63.19	120.24	59.36
9	64.72	122.83	61.28
10	66.16	125.46	63.20
11	67.51	128.13	65.11
12	68.78	130.86	67.03
13	69.95	133.62	68.95
14	71.02	136.42	70.87
15	72.01	139.25	72.79
16	72.36	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 3 SPECIFIED BY 16 COORDINATE POINTS

SAFETY FACTOR = 1.592
X-CENTER = -92.96
Y-CENTER = 199.06
RADIUS = 172.79

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	56.32
2	51.66	104.50	57.32
3	53.28	107.03	58.31
4	54.86	109.58	59.31
5	56.39	112.16	60.30
6	57.88	114.76	61.30
7	59.32	117.40	62.29
8	60.71	120.05	63.29
9	62.06	122.73	64.28
10	63.36	125.43	65.28
11	64.62	128.16	66.27
12	65.83	130.91	67.27
13	66.98	133.67	68.26
14	68.10	136.46	69.26
15	69.16	139.26	70.25
16	69.57	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 4 SPECIFIED BY 15 COORDINATE POINTS

SAFETY FACTOR = 1.639

X-CENTER = 2.42
Y-CENTER = 157.34
RADIUS = 70.56

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.40	105.60	44.06
2	52.56	107.69	46.50
3	54.62	109.87	48.93
4	56.59	112.13	51.37
5	58.46	114.47	53.81
6	60.24	116.89	56.24
7	61.90	119.39	58.68
8	63.46	121.95	61.12
9	64.91	124.58	63.55
10	66.25	127.26	65.99
11	67.47	130.00	68.42
12	68.57	132.79	70.86
13	69.56	135.63	73.30
14	70.42	138.50	75.73
15	70.90	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 5 SPECIFIED BY 16 COORDINATE POINTS

SAFETY FACTOR = 1.694

X-CENTER = -1430.94

Y-CENTER = 1028.77

RADIUS = 1746.23

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.20	103.80	58.06
2	51.79	106.35	58.16
3	53.37	108.90	58.26
4	54.95	111.45	58.36
5	56.52	114.00	58.46
6	58.09	116.56	58.56
7	59.66	119.12	58.65
8	61.22	121.68	58.75
9	62.77	124.25	58.85
10	64.32	126.82	58.95
11	65.87	129.39	59.05
12	67.41	131.96	59.15
13	68.95	134.53	59.24
14	70.49	137.11	59.34
15	72.02	139.69	59.44
16	72.44	140.40	

1

EARTH FAX

Midvale, UT (s/n 5080)

FAILURE SURFACE # 6 SPECIFIED BY 17 COORDINATE POINTS

SAFETY FACTOR = 1.703

X-CENTER = -68.42

Y-CENTER = 234.85

RADIUS = 176.76

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.20	103.80	42.64
2	52.41	105.84	43.61
3	54.58	107.91	44.58
4	56.72	110.01	45.55
5	58.82	112.15	46.53
6	60.88	114.33	47.50
7	62.91	116.54	48.47
8	64.90	118.79	49.44
9	66.85	121.07	50.42
10	68.76	123.38	51.39
11	70.63	125.72	52.36
12	72.46	128.10	53.33

13	74.25	130.51	54.31
14	76.00	132.94	55.28
15	77.71	135.41	56.25
16	79.38	137.90	57.22
17	80.99	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 7 SPECIFIED BY 19 COORDINATE POINTS

SAFETY FACTOR = 1.704

X-CENTER = -648.15
Y-CENTER = 764.60
RADIUS = 962.53

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	46.59
2	52.06	104.18	46.76
3	54.12	106.37	46.94
4	56.17	108.56	47.12
5	58.21	110.76	47.30
6	60.24	112.96	47.48
7	62.27	115.18	47.66
8	64.29	117.39	47.84
9	66.30	119.62	48.01
10	68.31	121.85	48.19
11	70.31	124.08	48.37
12	72.30	126.33	48.55
13	74.29	128.57	48.73
14	76.27	130.83	48.91
15	78.24	133.09	49.09
16	80.20	135.36	49.26
17	82.16	137.63	49.44
18	84.11	139.91	49.62
19	84.53	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 8 SPECIFIED BY 17 COORDINATE POINTS

SAFETY FACTOR = 1.758

X-CENTER = -126.92
Y-CENTER = 285.45
RADIUS = 252.56

FAILURE SURFACE #10 SPECIFIED BY 19 COORDINATE POINTS

SAFETY FACTOR = 1.850

X-CENTER = 20.10

Y-CENTER = 163.40

RADIUS = 68.29

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	27.22
2	52.67	103.38	29.74
3	55.27	104.86	32.26
4	57.81	106.47	34.77
5	60.27	108.18	37.29
6	62.66	109.99	39.81
7	64.97	111.92	42.33
8	67.18	113.94	44.84
9	69.31	116.05	47.36
10	71.34	118.26	49.88
11	73.28	120.55	52.39
12	75.11	122.93	54.91
13	76.83	125.38	57.43
14	78.45	127.91	59.95
15	79.95	130.51	62.46
16	81.34	133.17	64.98
17	82.60	135.89	67.50
18	83.75	138.66	70.02
19	84.39	140.40	

1

EARTH FAX

Midvale, UT (s/n 5080)

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.40	105.60	44.94
2	52.52	107.72	45.62
3	54.62	109.87	46.30
4	56.70	112.04	46.98
5	58.74	114.23	47.66
6	60.76	116.45	48.34
7	62.76	118.69	49.02
8	64.72	120.95	49.70
9	66.66	123.24	50.38
10	68.58	125.55	51.06
11	70.46	127.89	51.74
12	72.32	130.24	52.42
13	74.15	132.62	53.10
14	75.95	135.02	53.78
15	77.72	137.44	54.46
16	79.47	139.88	55.14
17	79.83	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 9 SPECIFIED BY 13 COORDINATE POINTS

SAFETY FACTOR = 1.812

X-CENTER = -15.12
Y-CENTER = 156.97
RADIUS = 82.31

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.60	107.40	54.02
2	52.36	109.83	56.11
3	54.04	112.32	58.20
4	55.62	114.87	60.29
5	57.10	117.48	62.37
6	58.49	120.14	64.46
7	59.79	122.84	66.55
8	60.98	125.59	68.64
9	62.07	128.39	70.73
10	63.06	131.22	72.82
11	63.95	134.09	74.90
12	64.73	136.98	76.99
13	65.23	139.13	

1

EARTH FAX
Midvale, UT (s/n 5080)

Y A X I S

100.00 118.75 137.50 156.25 175.00 193.75

X .00 *-----+

18.75 +

A 37.50 +

X 56.25 +

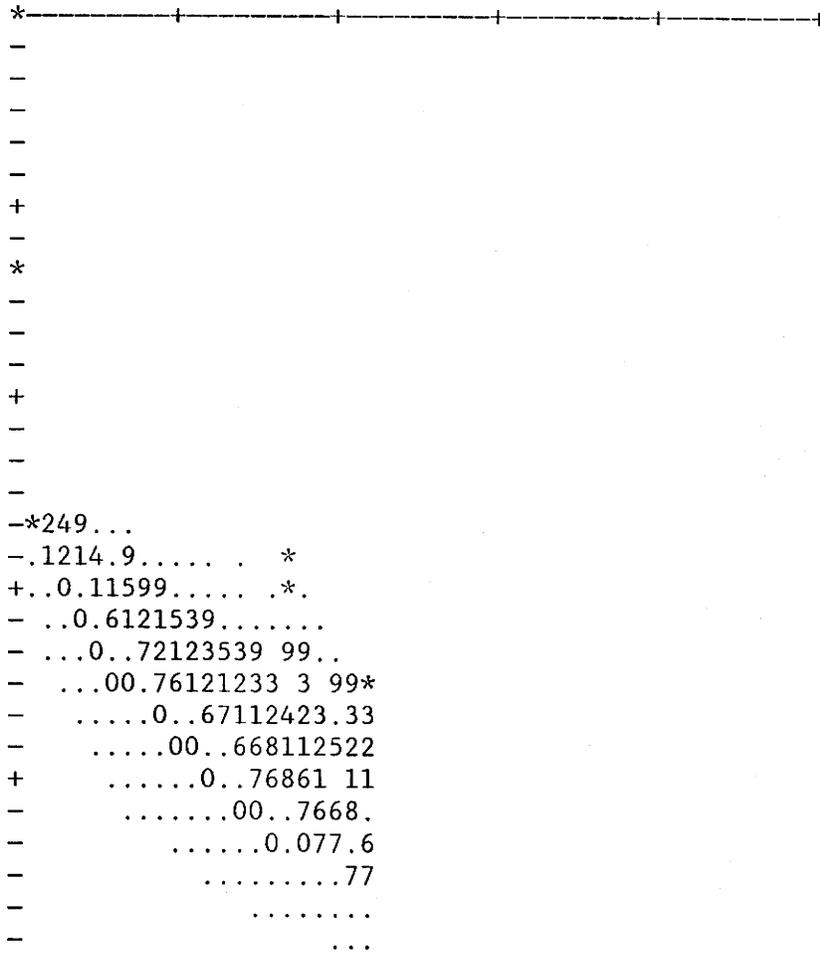
I 75.00 +

S 93.75 +

112.50 +

131.25 +

150.00 +



*

Genwal Coal Company
Crandall Canyon Mine

Storage Pad Stability Analysis
November 9, 1990

APPENDIX C

Slope Stability Analysis Under Dynamic Conditions - Computer Output

PROFIL

GENWAL - Proposed storage pad expansion. Scoured debris slope. E.Q. = 0.07g

6

6

0.0 100.0 25.0 100.0 1

25.0 100.0 50.0 102.0 1

50.0 102.0 53.3 131.7 1

53.3 131.7 55.0 131.8 1

55.0 131.8 67.0 140.4 1

67.0 140.4 150.0 140.4 1

SOIL

1

120.0 130.0 700.0 46.0 0.0 0.0 1

EQUAKE

0.07

0.0

0.0

CIRCL2

11

10

50.0 52.0

55.0 90.0

0.0

3.0

80.0

5.0

GEOSLOPE
Version 3.11

Supplied by GEOCOMP Corp.
342 Sudbury Rd., Concord, MA. 01742
(617) 369-8304

Portions of this software and documentation are
copyrighted 1983,1984,1985 by GEOCOMP Corp.
All rights are reserved

GEOSLOPE is based on the program, STABL3,
developed at Purdue University under sponsorship
of the Federal Highway Administration.

GEOCOMP Corp. has modified the program to run on
various microcomputers and plotting devices.

GEOCOMP Corp. makes no warranties as to the fitness
of this software. The user bears all responsibility
for accuracy and correctness of results produced by
this software. See the users manual for further
warranty information.

Supplied under exclusive license to :
EARTH FAX
Midvale, UT (s/n 5080)

1
EARTH FAX
Midvale, UT (s/n 5080)

—SLOPE STABILITY ANALYSIS—
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION GENWAL - Proposed storage pad expansion.
Scoured debris slope. E.Q. = 0.07g

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT	Y-LEFT	X-RIGHT	Y-RIGHT	SOIL TYPE BELOW BND
1	.00	100.00	25.00	100.00	1
2	25.00	100.00	50.00	102.00	1
3	50.00	102.00	53.30	131.70	1
4	53.30	131.70	55.00	131.80	1
5	55.00	131.80	67.00	140.40	1
6	67.00	140.40	150.00	140.40	1

ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT.	SATURATED UNIT WT.	COHESION INTERCEPT	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT	PIEZOMETRIC SURFACE NO.
1	120.0	130.0	700.0	46.0	.00	.0	1

A HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
OF .070 HAS BEEN ASSIGNED

A VERTICAL EARTHQUAKE LOADING COEFFICIENT
OF .000 HAS BEEN ASSIGNED

CAVITATION PRESSURE = .0

A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

110 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 11 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = 50.00
AND X = 52.00

EACH SURFACE TERMINATES BETWEEN X = 55.00
AND X = 90.00

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00

3.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

RESTRICTIONS HAVE BEEN IMPOSED UPON THE ANGLE OF INITIATION.
THE ANGLE HAS BEEN RESTRICTED BETWEEN THE ANGLES OF 5.0 AND 80.0 DEG.

FACTOR OF SAFETY CALCULATION HAS GONE THROUGH TEN ITERATIONS

FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

SAFETY FACTORS ARE CALCULATED BY THE MODIFIED BISHOP METHOD.

EARTH FAX
 Midvale, UT (s/n 5080)

FAILURE SURFACE # 1 SPECIFIED BY 17 COORDINATE POINTS

SAFETY FACTOR = 1.450

X-CENTER = -226.27
 Y-CENTER = 318.27
 RADIUS = 350.85

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	52.19
2	51.84	104.37	52.68
3	53.66	106.76	53.17
4	55.46	109.16	53.66
5	57.23	111.58	54.15
6	58.99	114.01	54.64
7	60.73	116.46	55.13
8	62.44	118.92	55.62
9	64.14	121.39	56.11
10	65.81	123.88	56.60
11	67.46	126.39	57.09
12	69.09	128.91	57.58
13	70.70	131.44	58.07
14	72.29	133.99	58.56
15	73.85	136.55	59.05
16	75.39	139.12	59.54
17	76.15	140.40	

SLICE NO.	X	DX	DW	DQ	DU	DN	DSr
1	50.92	1.84	1564.91	.00	.00	357.64	737.98
2	52.57	1.46	3469.14	.00	.00	2167.32	2030.05
3	53.48	.36	1083.11	.00	.00	729.28	1003.32
4	54.33	1.34	3880.66	.00	.00	2575.80	2321.69
5	55.23	.46	1266.32	.00	.00	830.12	1075.32
6	56.35	1.78	4777.27	.00	.00	3092.40	2690.53
7	58.11	1.76	4477.53	.00	.00	2837.50	2508.54
8	59.86	1.74	4176.98	.00	.00	2580.73	2325.21
9	61.59	1.72	3875.97	.00	.00	2322.28	2140.68
10	63.29	1.69	3574.77	.00	.00	2062.34	1955.10
11	64.97	1.67	3273.69	.00	.00	1801.11	1768.58
12	66.40	1.19	2169.54	.00	.00	1132.24	1291.02
13	67.23	.46	794.36	.00	.00	398.56	767.20
14	68.28	1.63	2494.25	.00	.00	1119.00	1281.57
15	69.90	1.61	1973.77	.00	.00	659.93	953.81
16	71.49	1.59	1463.65	.00	.00	206.93	630.37
17	73.07	1.56	964.15	.00	.00	-239.82	311.41
18	74.62	1.54	475.51	.00	.00	-680.12	-2.95
19	75.77	.75	57.98	.00	.00	-499.55	125.97

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 2 SPECIFIED BY 16 COORDINATE POINTS

SAFETY FACTOR = 1.470

X-CENTER = -13.14
Y-CENTER = 167.20
RADIUS = 89.61

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.20	103.80	45.93
2	52.29	105.96	47.85
3	54.30	108.18	49.77
4	56.24	110.47	51.69
5	58.10	112.83	53.60
6	59.88	115.24	55.52
7	61.58	117.72	57.44
8	63.19	120.24	59.36
9	64.72	122.83	61.28
10	66.16	125.46	63.20
11	67.51	128.13	65.11
12	68.78	130.86	67.03
13	69.95	133.62	68.95
14	71.02	136.42	70.87
15	72.01	139.25	72.79
16	72.36	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 3 SPECIFIED BY 16 COORDINATE POINTS

SAFETY FACTOR = 1.483

X-CENTER = -92.96
Y-CENTER = 199.06
RADIUS = 172.79

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	56.32
2	51.66	104.50	57.32
3	53.28	107.03	58.31
4	54.86	109.58	59.31
5	56.39	112.16	60.30
6	57.88	114.76	61.30
7	59.32	117.40	62.29
8	60.71	120.05	63.29
9	62.06	122.73	64.28

10	63.36	125.43	65.28
11	64.62	128.16	66.27
12	65.83	130.91	67.27
13	66.98	133.67	68.26
14	68.10	136.46	69.26
15	69.16	139.26	70.25
16	69.57	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 4 SPECIFIED BY 15 COORDINATE POINTS

SAFETY FACTOR = 1.520

X-CENTER = 2.42
Y-CENTER = 157.34
RADIUS = 70.56

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.40	105.60	44.06
2	52.56	107.69	46.50
3	54.62	109.87	48.93
4	56.59	112.13	51.37
5	58.46	114.47	53.81
6	60.24	116.89	56.24
7	61.90	119.39	58.68
8	63.46	121.95	61.12
9	64.91	124.58	63.55
10	66.25	127.26	65.99
11	67.47	130.00	68.42
12	68.57	132.79	70.86
13	69.56	135.63	73.30
14	70.42	138.50	75.73
15	70.90	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 5 SPECIFIED BY 19 COORDINATE POINTS

SAFETY FACTOR = 1.535

X-CENTER = -648.15
Y-CENTER = 764.60
RADIUS = 962.53

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	46.59
2	52.06	104.18	46.76

3	54.12	106.37	46.94
4	56.17	108.56	47.12
5	58.21	110.76	47.30
6	60.24	112.96	47.48
7	62.27	115.18	47.66
8	64.29	117.39	47.84
9	66.30	119.62	48.01
10	68.31	121.85	48.19
11	70.31	124.08	48.37
12	72.30	126.33	48.55
13	74.29	128.57	48.73
14	76.27	130.83	48.91
15	78.24	133.09	49.09
16	80.20	135.36	49.26
17	82.16	137.63	49.44
18	84.11	139.91	49.62
19	84.53	140.40	

1

EARTH FAX

Midvale, UT (s/n 5080)

FAILURE SURFACE # 6 SPECIFIED BY 17 COORDINATE POINTS

SAFETY FACTOR = 1.546

X-CENTER = -68.42

Y-CENTER = 234.85

RADIUS = 176.76

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.20	103.80	42.64
2	52.41	105.84	43.61
3	54.58	107.91	44.58
4	56.72	110.01	45.55
5	58.82	112.15	46.53
6	60.88	114.33	47.50
7	62.91	116.54	48.47
8	64.90	118.79	49.44
9	66.85	121.07	50.42
10	68.76	123.38	51.39
11	70.63	125.72	52.36
12	72.46	128.10	53.33
13	74.25	130.51	54.31
14	76.00	132.94	55.28
15	77.71	135.41	56.25
16	79.38	137.90	57.22
17	80.99	140.40	

1

EARTH FAX

Midvale, UT (s/n 5080)

FAILURE SURFACE # 7 SPECIFIED BY 16 COORDINATE POINTS

SAFETY FACTOR = 1.555

X-CENTER = -1430.94

Y-CENTER = 1028.77

RADIUS = 1746.23

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.20	103.80	58.06
2	51.79	106.35	58.16
3	53.37	108.90	58.26
4	54.95	111.45	58.36
5	56.52	114.00	58.46
6	58.09	116.56	58.56
7	59.66	119.12	58.65
8	61.22	121.68	58.75
9	62.77	124.25	58.85
10	64.32	126.82	58.95
11	65.87	129.39	59.05
12	67.41	131.96	59.15
13	68.95	134.53	59.24
14	70.49	137.11	59.34
15	72.02	139.69	59.44
16	72.44	140.40	

1

EARTH FAX

Midvale, UT (s/n 5080)

FAILURE SURFACE # 8 SPECIFIED BY 17 COORDINATE POINTS

SAFETY FACTOR = 1.594

X-CENTER = -126.92

Y-CENTER = 285.45

RADIUS = 252.56

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.40	105.60	44.94
2	52.52	107.72	45.62
3	54.62	109.87	46.30
4	56.70	112.04	46.98
5	58.74	114.23	47.66
6	60.76	116.45	48.34
7	62.76	118.69	49.02
8	64.72	120.95	49.70
9	66.66	123.24	50.38
10	68.58	125.55	51.06
11	70.46	127.89	51.74
12	72.32	130.24	52.42

13	74.15	132.62	53.10
14	75.95	135.02	53.78
15	77.72	137.44	54.46
16	79.47	139.88	55.14
17	79.83	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE # 9 SPECIFIED BY 19 COORDINATE POINTS

SAFETY FACTOR = 1.689

X-CENTER = 20.10
Y-CENTER = 163.40
RADIUS = 68.29

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.00	102.00	27.22
2	52.67	103.38	29.74
3	55.27	104.86	32.26
4	57.81	106.47	34.77
5	60.27	108.18	37.29
6	62.66	109.99	39.81
7	64.97	111.92	42.33
8	67.18	113.94	44.84
9	69.31	116.05	47.36
10	71.34	118.26	49.88
11	73.28	120.55	52.39
12	75.11	122.93	54.91
13	76.83	125.38	57.43
14	78.45	127.91	59.95
15	79.95	130.51	62.46
16	81.34	133.17	64.98
17	82.60	135.89	67.50
18	83.75	138.66	70.02
19	84.39	140.40	

1

EARTH FAX
Midvale, UT (s/n 5080)

FAILURE SURFACE #10 SPECIFIED BY 15 COORDINATE POINTS

SAFETY FACTOR = 1.692

X-CENTER = -67.32
Y-CENTER = 225.16
RADIUS = 165.52

POINT NO.	X-SURF	Y-SURF	ALPHA (DEG)
1	50.80	109.20	46.05
2	52.88	111.36	47.09
3	54.93	113.56	48.13
4	56.93	115.80	49.16
5	58.89	118.07	50.20
6	60.81	120.37	51.24
7	62.69	122.71	52.28
8	64.52	125.08	53.32
9	66.32	127.49	54.36
10	68.06	129.93	55.39
11	69.77	132.40	56.43
12	71.43	134.90	57.47
13	73.04	137.42	58.51
14	74.61	139.98	59.55
15	74.85	140.40	

1

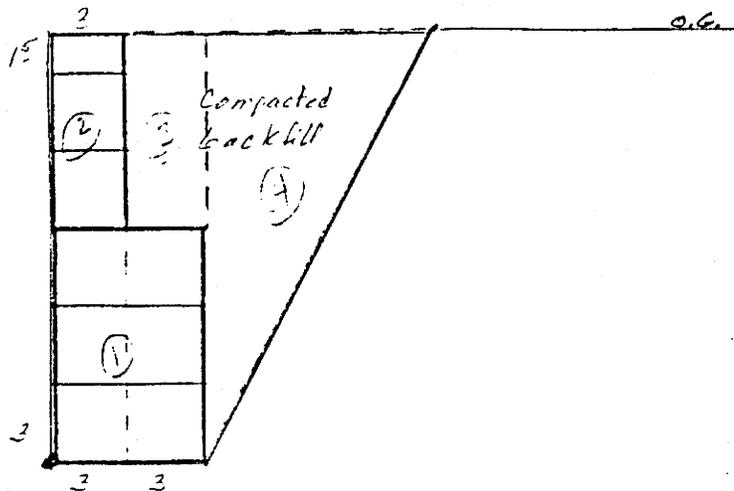
EARTH FAX

Midvale, UT (s/n 5080)

Appendix 3-20

Road Expansion (within permit area)

Safety Factor, Drawings



Given:

Wire baskets

$\gamma = 112 \text{ lb/ft}^3$
 Section ① $l = 6'$ $x = 0$ slope 1 (square)
 $h = 9'$ $y = 0$
 Section ② $l = 3'$ $x = 0$ slope 1
 $h = 7.5$ $y = 9$

Compacted Backfill

$\gamma = 137 \text{ lb/ft}^3$ Gm material $\phi = 34^\circ$
 $\tan \phi = .67$
 Section ③ $l = 3$ $x = 3$ slope 1
 $h = 7.5$ $y = 9$
 Section ④ $l = 9$ $x = 6$ slope 2 (triangle)
 $h = 16.5$ $y = 0$

Rotation: $i/b = 9.5^\circ$
 friction factor = 0.67 ($\tan \phi$)
 Top of wire $= 16.5 \text{ ft}$
 Pressure @ Top = 0
 Pressure @ Bottom =

$P = \gamma z \tan^2 (45 - \frac{1}{2} \phi)$
 $P = 137 z (.28)$
 $P = 38.7 \cdot z$
 when $z = 16.5$ $P = \underline{\underline{640}}$

$\frac{1}{15}$ correction = 5.2
 $\frac{1}{15}$ sliding = 9.3

22-141 50 SHEETS
 22-142 100 SHEETS
 22-144 200 SHEETS



RETAINING WALLS

Enter up to 10 areas.
Enter (Return) only for type to end.

- TYPE: 1 - RECTANGLE (L & H)
2 - TRIANGLE (L & H)
3 - 1/4 CIRCLE (R & -)
4 - 1/2 CIRCLE (R & -)
5 - CIRCLE (R & -)

TYPE	WEIGHT	DIM-A	DIM-B	PCT.	X-DIST.	Y-DIST.
1	112	6	9	0	0	0
1	112	3	7.3	0	0	9
1	137	3	7.3	0	3	9
1	137	9	16.5	0	6	0

RESULTS

WT=	21,628.750
LH=	6.425
LV=	5.500
TH=	5,280.000
TV=	21,628.750
HT=	1,608.750
TN=	22,341.000
FS-O=	5.100
FS-S=	5.000
S=	5.250
S-TOE=	15,415.625
S-HEEL=	10,920.125

FRICITION FACTOR 0.5
 PRESSURE FRIC 0 16.5
 RESULTS FRIC 0 0
 FRICTION FACTOR 0.5
 PRESSURE 0 16.5
 RESULTS FRIC 0 0

ENTER AREA 4 ROTATION/FRICTION/PRESSURE (Y/N) ? Y



4.0 HAUL ROAD DESIGN

In accordance with recommendations by Genwal, the haul road was designed as a flexible pavement structure with a 5-year design life. The AASHTO Interim Guide for the Design of Pavement Structures (1972) was used as the design procedure.

The following assumptions were made for the flexible pavement design:

1. The serviceability index of the road is 2.0 (recommended value for highways with low traffic volumes). The serviceability index of a pavement is defined as the lowest index that will be tolerated before resurfacing or reconstruction becomes necessary. The factors used to calculate the serviceability index include the slope variance along the wheel path, the depth of the wheel path rut, the area of asphalt which has cracked, and the area of asphalt which has been patched (Oglesby and Hicks, 1982). In comparison, a serviceability index of 2.5 is used for the interstate system where high velocity and high volume traffic is expected.
2. The native soil classifies as a good subgrade material and has a minimum California Bearing Ratio of 10% of standard at 0.1-inch penetration.
3. The empty weight of the tractor/trailer vehicles is 38,940 lbs and the loaded weight is 129,000 lbs. Therefore, the payload is 90,060 lbs. The axle loadings are as presented in Appendix D (from Genwal).
4. 1,000,000 tons of coal are hauled from the mine annually (Genwal). Therefore, with a payload of 90,060 lbs, 22,207 empty and loaded rigs will drive the road annually (85 trucks daily).
5. Load contributions through passenger cars and light trucks are negligible.

The haul road design procedures and calculations are presented in Appendix B. From these calculations, recommended combinations of pavement and road base thicknesses for various Marshall Stability values are presented in Table 4-1.

TABLE 4-1

Recommended Pavement Thicknesses for Various Marshall Stability Values

Marshall Stability Value of Pavement (lbs) ^(a)	Recommended Pavement Thickness (inches)	Recommended Road Base Thickness (Total) (inches)
1200	6.5	8.0
1500	6.0	7.0
1800	5.5	7.0
2100	5.0	7.0
2400	4.5	8.0

(a) Minimum Marshall Stability Value which can be consistently produced by the asphalt plant.

The Marshall Stability is a laboratory test conducted on the asphalt to determine the flexural strength. Marshall stability values generally range between 1000 pounds for parking lots to more than 2500 pounds for good interstate pavements. Selection of the design Marshall Stability should be based on the minimum value which can be consistently achieved by the asphalt producer. The road should be constructed of plant mix asphalt rather than road mix to achieve a higher Marshall Stability and, consequently, a lesser pavement thickness.

According to Table 4-1, 7 to 8 inches of road base (total) are required to preclude failure of the subgrade soil. According to Genwal, approximately 8 inches of road base have currently been placed along the haul road and compacted with repeated passes of haul trucks. Therefore, additional road base is not required for structural purposes. Additional road base should be placed and compacted, however, to even the roadbed prior to placing the asphaltic surface.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This report represents an expression of opinions and recommendations based on field observations, laboratory analyses, and professional judgement. It is recommended that a geotechnical or geological engineer be on site during construction of the haul road to allow adequate field decisions to be made regarding local conditions.

In accordance with recommendations by Genwal, the haul road was designed as a flexible pavement structure with a 5-year design life. The AASHTO Interim Guide for the Design of Pavement Structures (1972) was used as the design procedure. Actual conditions which significantly deviate from the assumptions listed in Section 4.0 may render the design inadequate and in need of revision.

Recommended combinations of pavement and road base thicknesses for various Marshall Stability values were provided in Table 4-1. The road should be constructed of plant mix asphalt rather than road mix. Selection of the Marshall Stability value should be based on the minimum value which the asphalt plant can consistently produce. The pavement should be placed and compacted in accordance with standard construction practices.

For structural purposes, it is not necessary to place additional road base along the haul road if the nominal thickness of the existing road base is approximately 8 inches. However, it may be necessary to place additional road base to even the roadbed prior to placing the asphaltic surface.

Road base material should have a minimum CBR value of 48% of standard at 0.1-inch penetration and should conform to the AASHTO A-1 soil requirements. Road base should be compacted to a minimum of 96% of the modified Proctor density (132.8 pcf at 6.9% moisture from Table 3-1). All materials larger than 2 inches in diameter should be removed from the base course material to promote more

Genwal Coal Company
Crandall Canyon Mine

Flexible Pavement Haul Road Design
November 9, 1990

effective compaction and to avoid stress concentrations which can cause local shear failure of the asphaltic pavement.

6.0 REFERENCES

- AASHTO. 1972. Interim Guide for Design of Pavement Structures. NCHRP Report 128.
- Davis and Doelling. 1977. Coal Drilling at Trail Mountain, North Horn Mountain, and Johns Peak Areas, Wasatch Plateau. Utah Geological and Mineral Survey Bulletin 112. Salt Lake City, Utah.
- EarthFax Engineering, Inc. 1990. Storage Pad Slope Stability Analysis at the Crandall Canyon Mine, Emery County, Utah. Project report prepared for Genwal Coal Company, Huntington, Utah.
- Oglesby, C.H., and R.G. Hicks. 1982. Highway Engineering. John Wiley & Sons, New York, New York.
- Utah Department of Transportation. 1979. State of Utah Standard Specifications for Road and Bridge Construction. Utah Department of Transportation, Salt Lake City, Utah.