DOE/ET/27158

DO NOT MICROFILM
THIS PAGE

DIRECT UTILIZATION OF GEOTHERMAL
ENERGY IN WESTERN SOUTH DAKOTA
AGRIBUSINESS

FOURTH QUARTERLY REPORT
April 1, 1979 - June 30, 1979

Dr. Stanley M. Howard
Principal Investigator

FC07-78ET27158

Work Performed Under Contract No. .
ET-78-F-07-1729

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY
Rapid City, South Dakota 57701

U. S. DEPARTMENT OF ENERGY
Geothermal Energy

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DOE/ET/27158--T1

DIRECT UTILIZATION OF GEOTHERMAL ENERGY
IN WESTERN SOUTH DAKOTA AGRIBUSINESS

DOE/ET/27158--T1

DE83 017043

(PON) ET-78-F-07-1729

QUARTERLY TECHNICAL PROGRESS REPORT

FOR

APRIL 1, 1979 THROUGH JUNE 30, 1979

BY

Dr. Stanley M. Howard
Mr. William H. Grams
Dr. Dan D. Carda
Mr. Thomas J. Zeller

U. S. Department of Energy
Division of Geothermal Energy

and

EG & G, Idaho, Inc.
Idaho Falls, ID

July 19, 1979

Dr. Stanley M. Howard and Dr. Dan D. Carda from the South Dakota School of Mines and Technology are Project Manager and Project Associate, respectively. Mr. William H. Grams and Mr. Thomas J. Zeller from RE/SPEC Inc. are Project Engineer and Project Analyst, respectively.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

NOTICE
PORTIONS OF THIS REPORT ARE ILLEGIBLE.
It has been reproduced from the best available copy to permit the broadest possible availability.

TABLE OF CONTENTS

	<u>Page</u>
1. INTRODUCTION	1
2. PROGRESS AND COST SCHEDULES AND WORK PLAN	2
3. ACCEPTANCE STATEMENTS	2
Environmental	
Design	
4. ENVIRONMENTAL BASELINE MONITORING	2
5. CONSTRUCTION CONTRACT WITH EXHIBITS	2

1. INTRODUCTION

Two firms submitted bids on May 14 for the construction phase of the project:

Oahe Plumbing and Heating; Pierre, SD--\$204,979

Gerlach and Ebert Plumbing; Rapid City, SD--\$245,000.

Since both of these bids far exceeded the construction phase budget, the original design was modified to reduce costs and negotiated bids were received. Significant changes were

1. replacement of the feed lot shed heating with concrete slab heating demonstrating the same technology
2. splitting of the isolation heat exchanger with one part at the grain dryer and one part at the shop;
3. reduction of the pipeline minimum depth from five to four feet;
4. reduction in the size of the control wire from #8-2 to #10-2;
5. simplification of the grain dryer heat exchanger building;
6. redesign of the mobile home heating systems from below to above ground.

Gerlach and Ebert Plumbing submitted a new bid for the revised design of \$154,589. Oahe Plumbing and Heating did not submit a revised bid or provide relevant supporting documents as requested apparently because of the turmoil caused by the death of the firm's owner. Therefore, the bid of Gerlach and Ebert Plumbing was accepted. The complete contract with design drawings is contained in section 5 of this report.

This report also contains the acceptance statements for the environmental and the design phases of the project in addition to the baseline environmental monitoring data.

2. PROGRESS AND COST SCHEDULES AND WORK PLAN

Figures 2.1 and 2.2 show the Progress and Cost Schedules. Delays in progress were caused by redesign and contract negotiation. Construction will begin July 23 and disparities between actual and forecast costs will decrease.

The construction contract requires a 125-day completion. However, an earlier completion is likely. Therefore, the system will be operational for the coming heating season.

3. ACCEPTANCE STATEMENTS

Copies of the environmental and design acceptance letters follow Figure 2.2.

4. ENVIRONMENTAL BASELINE MONITORING

Tables 4.1 - 4.4 show the results of the baseline monitoring of the reservoirs that will catch the discharged geothermal water. Reservoir 1 is the first catchment reservoir; Reservoir 2 the second; and Reservoir 3 the last. Reservoir C is a control reservoir which will be unaffected by the project.

5. CONSTRUCTION CONTRACT WITH EXHIBITS

The construction contract with all associated exhibits follows Table 4.4.

DIAMOND RING GEOTHERMAL PROJECT

*Completion scheduled for 11/23/79.

Figure 2.1 - Progress Schedule

COST SUMMARY REPORT
(In Thousands of Dollars)

Figure 2.2 - Cost Schedule

COST SUMMARY REPORT
(In Thousands of Dollars)

Data as of : estimated for month
ending June 30, 1979

Figure 2.2 (cont'd) - Cost Schedule

Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

MAY 25 1979

Dr. Stanley M. Howard
South Dakota School of Mines
and Technology
500 East, St. Joseph
Rapid City, SD 57701

Dear Dr. Howard:

SUBJECT: APPROVAL OF THE DIAMOND RING RANCH ENVIRONMENTAL REPORT COOPERATIVE
AGREEMENT NO. DE-FC07-78ET28419 (FORMERLY ET-78-F-07-1729)

REFERENCE: ENVIRONMENTAL REPORT, DEMONSTRATION PROJECT FOR NON-ELECTRIC
APPLICATIONS OF GEOTHERMAL ENERGY, PREPARED BY S. M. HOWARD,
SDSM&T, 8-10-78

The U.S. Department of Energy, Idaho Falls Operations Office, has completed a detailed review of the referenced report and enclosed amendment dated May 10, 1979. With the addition of the amendment, the environmental report is hereby approved by this office. Construction on the Diamond Ring Ranch Geothermal Project may proceed.

The report and amendment will be kept on file for inspection at:

U.S. Department of Energy
550 Second Street
Idaho Falls, ID 83401

Very truly yours,

C. R. Nichols, Asst. Director
Office of Geothermal Energy
Energy & Technology Division

Encl.:
Amendment

cc: J. Salisbury, DOE-HQ
J. O. Lee, DOE-ID
J. A. Strawn, EG&G

Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

MAY 24 1978

Dr. Stanley M. Howard
South Dakota School of Mines
and Technology
500 East St. Joseph
Rapid City, SD 57701

Dear Dr. Howard:

SUBJECT: APPROVAL OF THE DIAMOND RING RANCH FINAL DESIGN
COOPERATIVE AGREEMENT NO. DE-FC07-78-78ET (FORMERLY ET-78-F-07-1729)

The U.S. Department of Energy, Idaho Falls Operations Office, has reviewed and hereby approves your final design for the Diamond Ring Ranch geothermal project. Construction may proceed.

Sincerely,

Robert N. Chappell
U.S. Department of Energy
Energy & Technology Division
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

cc: J. O. Lee, DOE-ID
E. G. DiBello, EG&G

Table 4.1 - Water Analyses for August 8,
1978 (all ppm except pH).

SPECIES	GEOTHERMAL WATER	RESERVOIR			
		1	2	3	C
Cl	185	78	253	20	12
SO ₄	1087	602	166	338	204
SiO ₂	42	16	12	7	5
HCO ₃	126	138	80	100	112
NO ₃	-	3.8	0.1	0.4	0.3
Ca	381	146	92	100	46
Mg	79	44	33	19	12
Na	85	90	85	54	61
K	15	32	75	7	8
Fe	0.1	0.4	1	0.8	0.5
Mn	0.4	0.2	0.2	0.2	0.2
Total Hard.	-	548	365	329	164
T.D.S.	2066	1032	1232	538	356
Cu	-	<1	<1	-	<1
Pb	-	<1	<1	-	<1
Zn	-	<0.2	<0.2	-	<0.2
Cd	-	<0.1	<0.1	-	<0.1
Ni	-	<1	<1	-	<1
Hg	-	<0.002	<0.005	-	<0.002
pH	6.92	7.97	9.16	8.3	8.78

Table 4.2-- Water Analyses for November 7, 1978 (all ppm except pH).

SPECIES	RESERVOIR			
	1	2	3	C
Cl	(DRY)	80	11	12
SO ₄		69	450	365
SiO ₂		-	-	-
HCO ₃		-	-	-
NO ₃		-	-	-
Ca		170	104	64
Mg		49	33	29
Na		82	57	70
K		29	8	9
Fe		-	-	-
Mn		-	-	-
Total Hard.		-	-	-
T.D.S.		250	986	660
Cu		-	-	-
Pb		-	-	-
Zn		-	-	-
Cd		-	-	-
Ni		-	-	-
Hg		-	-	-
pH		6.93	7.35	7.15

Table 4.3 - Water Analyses for January 30,
1979 (all ppm except pH).

SPECIES	RESERVOIR			
	1	2	3	C
F	DRY	0.7	0.1	0.2
Cl		43	9	9
SO ₄		1087	448	544
SiO ₂		4.7	6.4	2.2
HCO ₃ ⁻		-	-	-
NO ₃		-	-	-
Ca		203	<0.5	<0.5
Mg		72	27	38
Na		120	70	110
K		36	9	13
Fe		-	-	-
Mn		-	-	-
Total Hard.		804	396	334
TDS		1584	668	994
Cu		<0.5	<0.5	<0.5
Pb		<0.2	<0.2	<0.2
Zn		<0.2	<0.2	<0.2
Cd		<0.1	<0.1	<0.1
Ni		<0.5	<0.5	<0.5
Hg		<0.003	<0.002	<0.002
pH		<8.03	<8.13	<8.22

Table 4.4 - Water Analysis for March 22, 1979.

	Reservoir #2	Reservoir C	Reservoir #4
pH	7.68	8.46	7.72
TDS	750	542	446
TSS	6	15	4
TH	390	273	277
Ca	104	59	80
Mg	31	30	19
Na	60	75	46
K	22	10	8
Cl	41	12	7
SO ₄	501	342	329
SiO ₂	6.4	6.5	10.9
NO ₃	1.006	.498	.101
OPO ₄	.42	.07	.05

PROPOSAL

GERLACH & EBERT

PLUMBING & HEATING

PHONE 342-0674

KOHLER & AMERICAN STANDARD PLUMBING FIXTURES / DAY & NIGHT GAS & ELECTRIC WATER HEATERS

P. O. Box 3065
RAPID CITY, SOUTH DAKOTA

QUOTATION PREPARED FOR:

Dr. Stanley M. Howard
South Dakota School Of Mines & Technology
Rapid City, South Dakota
JOB Geothermal Demonstration Project

DATE: July 5, 1979
LOCATION Diamond Ring Ranch

Dear Sir:

The undersigned proposes to furnish all materials and perform all labor necessary to complete the following:

All work in accordance with the revised plans & specifications issued July 3, 1979.
In arriving at this price all compaction of backfilled trenches has been deleted.

If the Performance Bond requirement is deleted the sum of \$1906.00 may be subtracted from the contract amount.

All of the above work to be completed in a substantial workmanlike manner for the sum of
One Hundred Fifty Four Thousand Five Hundred Eighty Nine (\$154,589.00) Dollars
Payments to be made each month as the work progresses to the value of (.90.%)
per cent of all work completed. The entire amount of contract to be paid within 30 days after completion.

Any alteration or deviation from the above specifications involving extra cost of material or labor will only be executed upon written orders for same, and will become an extra charge over the sum mentioned in this contract. All agreements must be made in writing.

The Contractor agrees to carry Workmen's Compensation and Public Liability Insurance, also to pay all Sales Taxes, Old Age Benefit and Unemployment Compensation Taxes upon the material and labor furnished under this contract, as required by the United States Government and the State in which his work is performed.

~~If a performance bond is required add ----- %~~

Respectfully submitted,

GERLACH & EBERT PLUMBING & HEATING

Contractor

ACCEPTANCE

This proposal signed by you and returned to us shall constitute a contract and a copy of same with our signature will be returned to you.

Date July 15, 1979

THIS AGREEMENT is dated as of the 18th day of July in the year 1979 by and between

South Dakota School of Mines and Technology,
Rapid City, South Dakota

(hereinafter called OWNER) and
Any reference to "Owner" regarding on site buildings and specifications refers to Diamond Ring Ranch and any reference to "Owner" in these contract documents refers to South Dakota School of Mines and Technology
(hereinafter called CONTRACTOR)

Gerlach & Ebert Plumbing and Heating
Rapid City, South Dakota

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. WORK.

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Geothermal Demonstration Project
Diamond Ring Ranch
40 miles West of Pierre on Highway 34, S.D.

The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:
Direct utilization of geothermal energy in Western South Dakota agribusiness

Article 2. ENGINEER.

The Project has been designed by RE/SPEC Inc., P. O. Box 725, Rapid City, SD 57709

who is hereinafter called ENGINEER and who will assume all duties and responsibilities and will have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

Article 3. CONTRACT TIME.

~~3.1. The Work will be substantially completed within 95 days after the date when the Contract Time commences to run as provided in paragraph 2.3 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.13 of the General Conditions within 125 days after the date when the Contract Time commences to run.~~

3.1. The Work will be substantially completed within 95 days after the date when the Contract Time commences to run as provided in paragraph 2.3 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.13 of the General Conditions within 125 days after the date when the Contract Time commences to run.

3.2. Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not substantially complete within the time specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not substantially complete on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER Two Hundred dollars (\$200.00) for each day that expires after the time specified in paragraph 3.1 for substantial completion until the Work is substantially complete.

Article 4. CONTRACT PRICE.

4.1. OWNER shall pay CONTRACTOR for performance of the Work in accordance with the Contract Documents in current funds as follows: See attached executed proposal of contractor and acceptance, marked Exhibit "A" and incorporated herein by reference
(here insert a lump sum, unit prices or both, attaching exhibits if necessary)

(CONTRACTOR's Bid may be attached as exhibit to avoid lengthy retyping of unit price schedules, formulae for escalation of prices, information as to alternatives, etc)

Article 5. PAYMENT PROCEDURES.

Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

5.1. *Progress Payments.* OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, on or about the... fifteenth ... day of each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values provided for in paragraph 14.1 of the General Conditions.

5.1.1. Prior to Substantial Completion progress payments will be in an amount equal to:

..... 90 % of the Work completed, and

..... 90 % of materials and equipment not incorporated in the Work but delivered and suitably stored, less in each case the aggregate of payments previously made.

5.1.2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95 % of the Contract Price, less such amounts as ENGINEER shall determine in accordance with paragraph 14.7 of the General Conditions.

5.2. *Final Payment.* Upon final completion and acceptance of the Work in accordance with paragraph 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.13.

Article 6. INTEREST.

All moneys not paid when due hereunder shall bear interest at the maximum rate allowed by law at the place of the Project.

Article 7. CONTRACTOR'S REPRESENTATIONS.

In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:

7.1. CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality, and with all local conditions and federal, state and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.

7.2. CONTRACTOR has studied carefully all 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 were relied upon by ENGINEER in the preparation of the Drawings and Specifications and which have been identified in the Supplementary Conditions.

7.3. CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to in paragraph 7.2 as he deems necessary for the performance of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by CONTRACTOR for such purposes.

7.4. CONTRACTOR has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

7.5. CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

7.6.

Article 8. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR are attached to this Agreement, made a part hereof and consists of the following:

8.1. This Agreement (pages 1 to ... 4 ..., inclusive).

8.2. Exhibits to this Agreement (pages ... 1 ... to ... 1 ..., inclusive).

8.3. Performance and other Bonds, identified as exhibits B and consisting of ... 2 ... pages.

8.4. Notice of Award.

8.5. General Conditions (pages ... 3 ... to ... 27 ..., inclusive).

8.6. Supplementary Conditions (pages ... 1 ... to ... 1 ..., inclusive).

8.7. Specifications bearing the title Geothermal Demonstration Project.

and consisting of 16 divisions and 88 pages, as listed in table of contents thereof.

8.8. Drawings, consisting of a cover sheet and sheets numbered 1 through 30 inclusive with each sheet bearing the following general title:

8.9. Addenda numbers 1 to 35, inclusive.

8.10. CONTRACTOR's Bid (pages 1 to 1, inclusive) marked exhibit A. (Attach Bid Form only in special circumstances).

8.11. Documentation submitted by CONTRACTOR prior to Notice of Award (pages 77 to 77, inclusive).

8.12. Any Modification, including Change Orders, duly delivered after execution of Agreement.

8.13. General provisions of cooperative agreements (pages 1 to 15, inclusive)

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be altered, amended or repealed by a Modification (as defined in Section 1 of the General Conditions).

Article 9. MISCELLANEOUS.

9.1. Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.

9.2. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

9.3. OWNER and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

Article 10. OTHER PROVISIONS. See Article 10 set forth in full on page 4 of this Agreement.

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or by ENGINEER on their behalf.

This Agreement will be effective on the 18th day of July, 1979.

OWNER SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY

CONTRACTOR GERLACH & EBERT PLUMBING AND HEATING

By Richard H. Schreiner

By [Signature]

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest [Signature]

Attest [Signature]

Address for giving notices

Address for giving notices

500 East St. Joseph

P.O. Box 3065, Rapid City, S.D. 57709

Rapid City, South Dakota 57701

Rapid City, South Dakota 57709

If OWNER is a public body attach evidence of authority to sign and resolution or other document authorizing execution of Agreement.)

License No.
Agent for service of process:

Article 10. OTHER PROVISIONS.

The parties hereto understand that the Department of Energy may at any time, upon giving sixty (60) days prior written notice, terminate this project. This agreement is expressly contingent upon Owner receiving additional funding of Seventy-four Thousand Nine Hundred Fifty-one Dollars (\$74,951.00) from the Department of Energy within sixty (60) days from the date of this agreement. This agreement shall terminate immediately upon Owner receiving written notice that no further funds will be received from the Department of Energy. Contractor shall not complete work, including materials, equipment and labor, requiring payment in excess of Eighty Thousand Dollars (\$80,000.00) prior to Owner receiving the additional funding from the Department of Energy. Contractor shall notify Owner in writing when payments to Contractor have accrued to Eighty Thousand Dollars (\$80,000.00) and Contractor shall not proceed further without written authorization from Owner. If said additional funding is not received by Owner from the Department of Energy, Owner's full liability to Contractor shall be a maximum of Eighty Thousand Dollars (\$80,000.00).

This Agreement will be effective on the 18th day of July, 1979.

OWNER
SOUTH DAKOTA SCHOOL OF MINES
AND TECHNOLOGY

BY: *Richard A. Schaeffer*

CONTRACTOR
GERLACH & EBERT PLUMBING AND
HEATING

BY: *MR Gerlach*

SPECIFICATIONS

FOR

GEOHERMAL DEMONSTRATION PROJECT
DIAMOND RING RANCH
40 Miles West of Pierre on Highway 34,
South Dakota

Project Manager:

Dr. Stanley M. Howard
South Dakota School of Mines & Technology
Rapid City, South Dakota
(605) 394-2341

Project Engineers:

RE/SPEC Inc.
One Concourse Drive, P. O. Box 725
Rapid City, South Dakota

TABLE OF CONTENTS

INVITATION TO BID

INSTRUCTIONS TO BIDDERS

BID FORM

BOND & FORMS

FORM OF AGREEMENT

GENERAL CONDITIONS

SUPPLEMENTAL CONDITIONS

SPECIFICATIONS

Copyright Articles removed.

DIVISION 1 GENERAL REQUIREMENTS

01021	Description of Work
01300	Submittals and Substitutions
01400	Testing
01500	Temporary Facilities and Controls
01600	Materials and Equipment
01700	Project Closeout
01800	Guarantee

DIVISION 2 SITE WORK

02010	Excavation for Structures
02100	Utilities
02200	Fill under Slabs and Footings
02300	Backfilling for Buildings and Structures
02400	Site Grading

DIVISION 3 CONCRETE

03100	Concrete Form work
03200	Concrete Reinforcement
03300	Cast-in-Place Concrete

DIVISION 4 MASONRY - Not used

DIVISION 5 METALS

05100	Structural Metal Framing
-------	--------------------------

DIVISION 6 WOOD

06100	Rough Carpentry
06101	Materials and Standards

DIVISION 7 THERMAL AND MOISTURE PROTECTION
07200 Insulation

DIVISION 8 DOORS AND WINDOWS - Not used

DIVISION 9 FINISHES - Not used

DIVISION 10 SPECIALTIES - Not used

DIVISION 11 EQUIPMENT - Not used

DIVISION 12 Not used

DIVISION 13 Special Construction - Not used

DIVISION 14 CONVEYING SYSTEMS - Not used

DIVISION 15 MECHANICAL

15010 General Provisions
15020 Excavation and Backfilling
15050 Basic Materials and Methods
15080 Insulation
15600 Heat Generation
15800 Air Distribution
15900 Controls and Instrumentation

DIVISION 16 ELECTRICAL

16010 General Provisions
16100 Basic Materials and Methods
16300 Light Fixtures
16400 Electrical Equipment
16500 Motor Connections and Wiring
16600 Mechanical Equipment
16700 Controls and Instrumentation

Geothermal Demonstration Project
Diamond Ring Ranch
INVITATION TO BID

Notice is hereby given that the South Dakota School of Mines and Technology will accept bids of General Contract for construction and installation of a Geothermal Demonstration Project on the Diamond Ring Ranch, located along Highway 34, approximately 40 miles west of Pierre, South Dakota. See Division 1 Section 01021 for further description of project.

Dr. Stanley M. Howard of the South Dakota School of Mines will accept bids until:

2:15 PM, May 14, 1979,

at the Mineral Industries Building Rm. 220, South Dakota School of Mines and Technology. Bids may be left with the Secretary of Mineral Industries Rm. 110. Bids received after that time will not be accepted. All interested parties are invited to attend. All bids will at that time and place be opened and read aloud.

Proposed Contract Documents may be examined at the following places:

RE/SPEC Inc.
Rapid City Builders Exchange

Bonafide General Contractor bidders may secure copies of the proposed Contract Documents upon payment of \$50.00 per set from RE/SPEC Inc., P. O. Box 725, Rapid City, SD 57709.

Bid Bond in the amount of 10% of the base bid will be required to accompany the bid. In lieu of a bid bond a cashier's check of 5% of the base bid made out in the name of the South Dakota School of Mines and Technology shall be required to accompany the bid. The owner reserves the right to reject any or all bids and to waive irregularity.

The owner reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the Information for Bidders.

No bidder may withdraw his bid within 30 days after the actual date of the opening thereof.

Date

SUPPLEMENTAL GENERAL CONDITIONS

1. Limits of liability and coverage of insurance required in paragraph 5.3 of General Conditions:

A. Workman's Compensation: Statutory
Employer's Liability: \$100,000.00

B. Public Liability (per person/per occurrence)

a. Bodily and personal injury: \$500,000.00/\$500,000.00
b. Property damage: \$500,000.00/\$500,000.00

C. Automobile Liability:

Bodily injury: \$150,000.00 each person
\$500,000.00 each occurrence
Property damage: \$100,000.00 each occurrence

2. The following Appendix B shall be included.

A. The following items from Appendix B are applicable.
8, 9, 19, 20, 24

B. Wherever the term "Participant" is used it means "Contractor".

3. Add to Article 14: Payments to Contractors

The owner shall retain 10% of all payments to contractor until final completion and acceptance of all work required by contract documents. The owner at any time, however, after 50% of the work has been completed, if he finds that satisfactory progress is being made, shall reduce retainage to five percent (5%) on the current and remaining estimate.

APPENDIX B

GENERAL PROVISIONS

COOPERATIVE AGREEMENTS

ARTICLE B.I - TITLE TO PROPERTY

The Participant will own and maintain title of all items of materials, supplies, and all tangible property incorporated into the proposed demonstration facilities provided for under this Agreement. The Government acknowledges and agrees that those costs incurred by the Participant are complete and adequate compensation for whatever rights and title the Government might otherwise have in the demonstration facilities.

ARTICLE B.II - LIMITATION OF COSTS (COST SHARING)

A. It is estimated that the cost to the Government for the performance of this Agreement will not exceed the estimated cost to the Government set forth in the Schedule, and the Participant agrees to use its best efforts to perform the work specified in the Schedule and Appendix A, and all obligations under this Agreement within such estimated cost to the Government plus the share of the cost of performance agreement to be borne by the Participant, as set forth in the Schedule. If, at any time, the Participant has reason to believe that the costs which it expects to be incurred in the performance of this Agreement in the next succeeding 60 days, when added to all costs previously incurred, will exceed 75 percent of the estimated total cost to the Government and to the Participant then set forth in the Schedule, or if, at any time, the Participant has reason to believe that the total cost for the performance of this Agreement (exclusive of any fee, if any) will be greater or substantially less than the estimated total cost set forth in the Schedule, the Participant shall notify the Contracting Officer in writing to that effect, giving its revised estimate of such total cost for the performance of this Agreement.

B. Except as required by other provisions of this Agreement, specifically citing and stated to be an exception from this article, the Government shall not be obligated to reimburse the Participant for costs incurred in excess of the estimated cost to the Government set forth in the Schedule, and the Participant shall not be obligated to continue performance under the Agreement (including actions under the "Termination" article) or otherwise to incur costs in excess of the estimated total cost set forth in the Schedule, unless and until the Contracting Officer shall have notified the Participant in writing that such estimated total cost has been increased and shall have specified in such notice a revised estimated total cost which shall thereupon constitute the estimated total cost of performance of this Agreement. The increase in such estimated total cost shall be allocated in accordance with the provisions of the Schedule governing such increase.

ARTICLE B.II - LIMITATION OF COSTS (COST SHARING) (Cont'd)

No notice, communication, or representation in any form, or from any person other than the Contracting Officer, shall affect the estimated cost to the Government of this Agreement. In the absence of the specified notice, the Government shall not be obligated to reimburse the Participant for any costs in excess of the estimated cost to the Government set forth in the Schedule, whether those excess costs were incurred during the course of the Agreement or as a result of termination. When and to the extent that the estimated total cost set forth in the Schedule has been increased, any costs incurred by the Participant in excess of the estimated total cost prior to such increase shall be allowable to the same extent and in the same percentage as if such costs had been incurred after the increase; unless the Contracting Officer issues a termination or other notice and directs that the increase is solely for the purpose of covering termination or other specified expenses.

C. Change orders issued under this Agreement shall not be considered an authorization to the Participant to exceed the estimated cost to the Government set forth in the Schedule in the absence of a statement in the change order, or other agreement modification, increasing the estimated cost.

ARTICLE B.III - ALLOWABLE COST

Costs shall constitute allowable costs as specified in Subpart 1-15.7 of the Federal Procurement Regulations (41 CFR-1-15.7), as in effect on the date of this Agreement.

ARTICLE B.IV - APPROVAL OF SUBCONTRACTS

All subcontracts and purchase orders shall require the written approval of the Contracting Officer.

ARTICLE B.V - PUBLIC INFORMATION RELEASES

The parties agree that public disclosure or dissemination of new data or information arising out of the design, construction or operation of the project will be coordinated by the parties, it being understood that the intent of both the Participant and DOE is to release all data and information to the greatest practicable extent in order to achieve the objective of obtaining maximum public value from the results of this project. It is understood that the foregoing is not intended to afford either party the right to prevent a public release by the other; however, nothing in this article shall impair the rights of the parties set forth elsewhere in this Agreement, including but not necessarily limited to the article entitled "Patent Rights."

ARTICLE B.VI - AUDIT

A. The Participant shall maintain, and the Contracting Officer or his representative shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this Agreement. Such right of examination shall include inspection at all reasonable times of the Participant's plants, or such parts thereof, as may be engaged in the performance of this Agreement.

B. The materials described above, shall be made available at the office of the Participant, at all reasonable times, for inspection, audit or reproduction, until the expiration of three (3) years from the date of final payment under this agreement or such lesser time specified in Part 1-20 of the Federal Procurement Regulations (41 CFR Part 1-20) and for such lesser period, if any, as is required by applicable statute, or by other articles of this Agreement by (1) and (2) below:

(1) If this Agreement is completely or partially terminated, the records relating to the work terminated shall be made available for a period of three (3) years from the date of any resulting final settlement.

(2) Records which relate to appeals under the "Disputes" article of this Agreement, or litigation or the settlement of claims arising out of the performance of this Agreement, shall be made available until such appeals, litigation, or claims have been disposed of.

ARTICLE B.VII - 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 therefrom; but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

ARTICLE B.VIII - COVENANT AGAINST CONTINGENT FEES

A. Warranty - Termination or Deduction for Breach. The Participant warrants that no person or selling agent has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Participant for the purpose of securing business. For breach or

ARTICLE B.VIII - COVENANT AGAINST CONTINGENT FEES (Cont'd)

violation of this warranty the Government shall have the right to annul this Agreement without liability or in its discretion to deduct from the Agreement price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

B. Contracts and Purchase Orders. Unless otherwise authorized by the Contracting Officer in writing, the Participant shall cause provisions similar to the foregoing to be inserted in all contracts and purchase orders entered into under this Agreement.

ARTICLE B.IX - EXAMINATION OF RECORDS BY COMPTROLLER GENERAL

A. The Participant agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three (3) years after final payment under this Agreement, unless DOE authorizes their prior disposition, have access to and the right to examine any directly pertinent books, documents, papers, and records of the Participant involving transactions related to this Agreement.

B. The Participant further agrees to include in all its subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three (3) years after final payment under the subcontract, or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this article excludes (1) purchase orders not exceeding \$10,000 and (2) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

C. Nothing in this Agreement shall be deemed to preclude an audit by the General Accounting Office of any transaction under this Agreement.

033178

ARTICLE B.X - ASSIGNMENT OF CLAIMS

Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), claims for moneys due or to become due the Participant from the Government under this Agreement may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this Agreement and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this Agreement, payments to assignee of any moneys due or to become due under this Agreement shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff.

ARTICLE B.XI - PERMITS

Except as otherwise directed by the Contracting Officer, the Participant shall procure all necessary permits or licenses and abide by all applicable laws, regulations, and ordinances of the United States and of the State, territory, and political subdivision in which the work under this Agreement is performed.

ARTICLE B.XII - DISPUTES

A. Except as otherwise provided in this Agreement, any dispute concerning a question of fact arising under this Agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Participant. The decision of the Contracting Officer shall be final and conclusive unless within thirty (30) days from the date of receipt of such copy, the Participant mails or otherwise furnishes to the Contracting Officer a written appeal addressed to DOE. The decision of DOE or its duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. In connection with any appeal proceeding under this article, the Participant shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Participant shall proceed diligently with the performance of this Agreement and in accordance with the Contracting Officer's decision.

B. This "Disputes" article does not preclude consideration of law questions in connection with decisions provided for in paragraph A, above: Provided, That nothing in this Agreement shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

ARTICLE B.XIII - PAYMENT OF INTEREST ON PARTICIPANT'S CLAIMS

A. If an appeal is filed by the Participant from a final decision of the Contracting Officer under the "Disputes" article of this Agreement, denying a claim arising under the Agreement, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the Participant. Such interest shall be at the rate determined by the Secretary of the Treasury pursuant to Public Law 92-41, 85 Stat. 97, from the date the Participant furnishes to the Contracting Officer its written appeal under the "Disputes" article of this Agreement, to the date of (1) a final judgment by a court of competent jurisdiction, or (2) mailing to the Participant of a supplemental agreement for execution either confirming completed negotiations between the parties or carrying out a decision of a board of contract appeals.

B. Notwithstanding A., above, (1) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal, and (2) interest shall not be paid for any period of time that the Contracting Officer determines the Participant has unduly delayed in pursuing its remedies before a board of contract appeals or a court of competent jurisdiction.

ARTICLE B.XIV - SEX DISCRIMINATION PROHIBITED

No person shall on the ground of sex be excluded from participation in, be denied a license under, be denied the benefits of, or be subjected under any program or activity carried on or receiving Federal assistance under any title of this Act (P. L. 93-438).

ARTICLE B.XV - CIVIL RIGHTS

The Participant agrees that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity for which the Participant receives Federal financial assistance from DOE.

ARTICLE B.XVI - DISCRIMINATION AGAINST HANDICAPPED PROHIBITED

The Participant agrees that no otherwise qualified handicapped individual in the United States [as defined in Section 7(6) of the Act], shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

ARTICLE B.XVII - SMALL AND MINORITY BUSINESS PARTICIPATION

It is the policy of DOE to ensure that small and minority businesses have a reasonable opportunity to participate in the projects which it supports. In accordance with this policy, the Participant will make a reasonable effort to ensure fair consideration and utilization of small and minority businesses in purchases and subcontracts awarded by the Participant under this Agreement.

ARTICLE B.XVIII - PREFERENCE FOR U. S. FLAG AIR CARRIERS

A. It is the policy of the United States that all Federal agencies and Government contractors and subcontracts utilize U. S. flag air carriers for international air transportation of personnel and cargo.

B. The Participant agrees to utilize U. S. flag air carriers to the maximum extent practicable in connection with the performance of this Agreement in the transportation by air of any personnel and cargo between the United States and a foreign country, or between foreign countries.

C. The terms used in this article have the following meanings:

(1) "International air transportation" means transportation by air of personnel and cargo from the United States to a foreign country, between two or more foreign countries, and between a foreign country and the United States.

(2) "U. S. flag air carrier" means one of a class of air carriers holding a certificate of public convenience and necessity issued by the Civil Aeronautics Board, approved by the President, authorizing operations between the United States and/or its territories and one or more foreign countries.

(3) The term "United States" includes the fifty States, Commonwealth of Puerto Rico, possessions of the United States and the District of Columbia.

(4) "Practicable" includes (i) satisfactory servicing of agency programs, and (ii) timely deliveries at fair and reasonable prices.

D. The Participant shall include the substance of this article, including this paragraph D. in each subcontract or purchase order hereunder which may involve air transportation between the United States and a foreign country, or between foreign countries.

ARTICLE B.XIX - CLEAN AIR AND WATER

A. The Participant agrees as follows:

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by P. L. 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251, et seq., as amended by P. L. 92-500), respectively, relating to inspection, monitoring, entry, reports and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this Agreement.

(2) That no portion of the work required by this Agreement will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this Agreement was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use its best efforts to comply with clean air standards and clean water standards at the facility in which the Agreement is being performed.

(4) To insert the substance of the provisions of this article into any nonexempt contract, including this subparagraph A.(4).

B. The terms used in this article have the following meanings:

(1) The term "Air Act" means the Clean Air Act, as amended (42, U.S.C. 1857, et seq., as amended by P. L. 91-604).

(2) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by P. L. 92-500).

(3) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110(d) of the Clean Air Act [42 U.S.C. 1857c-5(d)], an approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act (42 U.S.C. 1157(c)-6(c) or (d), or an approved implementation procedure under section 112(d) of the Air Act [42 U.S.C. 1857c-7(d)].

ARTICLE B.XIX - CLEAN AIR AND WATER (Cont'd)

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

(5) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

(6) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

ARTICLE B.XX - RIGHTS IN TECHNICAL DATA - SHORT FORM

A. Definitions. The definitions of terms set forth in 41 CFR 9-9.201 apply to the extent these terms are used herein.

B. Allocation of Rights.

(1) The Government shall have:

(i) Unlimited rights in technical data first produced or specifically used in the performance of this Agreement;

ARTICLE B.XX - RIGHTS IN TECHNICAL DATA - SHORT FORM (Cont'd)

(ii) The right of the Contracting Officer or his representatives to inspect at all reasonable times up to three (3) years after final payment under this Agreement all technical data first produced or specifically used in the Agreement (for which inspection the Participant or its subcontractor shall afford proper facilities to DOE);

(iii) The right to have any technical data first produced or specifically used in the performance of this Agreement delivered to the Government as the Contracting Officer may from time to time direct during the progress of the work or in any event as the Contracting Officer shall direct upon completion or termination of this Agreement.

(2) The Participant shall have: The right to use for its private purposes, subject to patent, security or other provisions of this Agreement, technical data it first produces in the performance of this Agreement provided the data requirements of this Agreement have been met as of the date of the private use of such data. The Participant agrees that to the extent it receives or is given access to proprietary data or other technical, business or financial data in the form of recorded information from DOE or a DOE contractor or subcontractor, the Participant shall treat such data in accordance with any restrictive legend contained thereon, unless use is specifically authorized by prior written approval of the Contracting Officer.

C. Copyrighted Material.

(1) The Participant agrees to, and does hereby grant to the Government, and to its officers, agents, servants and employees acting within the scope of their duties:

(i) A royalty-free nonexclusive, irrevocable license to reproduce, translate, publish, use, and dispose of and to authorize others so to do, all copyrightable material first produced or composed in the performance of this Agreement by the Participant, its employees or any individual or concern specifically employed or assigned to originate and prepare such material; and

(ii) A license as aforesaid under any and all copyrighted or copyrightable works not first produced or composed by the Contractor in the performance of this contract but which are

ARTICLE B.XX - RIGHTS IN TECHNICAL DATA - SHORT FORM (Cont'd)

incorporated in the material furnished under the Agreement, provided that such license shall be only to the extent the Participant now has, or prior to completion or final settlement of the Agreement may acquire, the right to grant such license without becoming liable to pay compensation to others solely because of such grant.

(2) The Participant agrees that it will not knowingly include any material copyrighted by others in any written or copyrightable material furnished or delivered under this Agreement without a license as provided for in subparagraph (1)(ii) hereof, or without the consent of the copyright owner, unless it obtains specific written approval of the Contracting Officer for the inclusion of such copyrighted material.

ARTICLE B.XXI - AUTHORIZATION AND CONSENT

The Government hereby gives its authorization and consent for all use and manufacture of any invention described in and covered by a patent of the United States in the performance of this Agreement or any part hereof or any amendment hereto or any subcontract hereunder (including any lower-tier subcontract).

ARTICLE B.XXII - NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT

(The provisions of this article shall be applicable only if the amount of this Agreement exceeds \$10,000.)

A. The Participant shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Agreement of which the Participant has knowledge.

B. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this Agreement or out of the use of any supplies furnished or work or services performed hereunder, the Participant shall furnish to the Government when requested by the Contracting Officer, all evidence and information in possession of the Participant pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Participant has agreed to indemnify the Government.

C. This article shall be included in all subcontracts.

ARTICLE B.XXIII - REPORTING OF ROYALTIES

If this contract is in an amount which exceeds \$10,000 and if any royalty payments are directly involved in the contract or are reflected in the contract price to the Government, the Contractor agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) during the performance of this contract and prior to its completion or final settlement the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this contract together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

ARTICLE B.XXIV - PATENT RIGHTS - SHORT FORM

A. Definitions.

(1) "Subject Invention" means any invention or discovery of the Contractor conceived or first actually reduced to practice in the course of or under this contract, and includes any art, method, process, machine, manufacture, design, or composition of matter, or any new and useful improvement thereof, or any variety of plants, whether patented or unpatented, under the Patent Laws of the United States of America or any foreign country.

(2) "Patent Counsel" means the DOE Patent Counsel assisting the procuring activity.

B. Invention Disclosures and Reports.

(1) The Participant shall furnish the Patent Counsel (with notification by Patent Counsel to the Contracting Officer):

(i) A written report containing full and complete technical information concerning each Subject Invention within 6 months after conception or first actual reduction to practice whichever occurs first in the course of or under this Agreement, but in any event prior to any on sale, public use, or public disclosure of such invention known to the Participant. The report shall identify the Agreement and inventor and shall be sufficiently

ARTICLE B.XXIV - PATENT RIGHTS - SHORT FORM (Cont'd)

complete in technical detail and appropriately illustrated by sketch or diagram to convey to one skilled in the art to which the invention pertains a clear understanding of the nature, purpose, operation, and to the extent known, the physical, chemical, biological, or electrical characteristics of the invention;

(ii) Upon request, but not more than annually, interim reports on a DOE-approved form listing Subject Inventions for that period and certifying that all Subject Inventions have been disclosed or that there were no such inventions; and

(iii) A final report on a DOE-approved form within 3 months after completion of the Agreement work listing all Subject Inventions and certifying that all Subject Inventions have been disclosed or that there were no such inventions.

(2) The Participant agrees that the Government may duplicate and disclose Subject Invention disclosures and all other reports and papers furnished or required to be furnished pursuant to the Agreement.

C. Allocation of Principal Rights.

(1) Assignment to the Government. The Participant agrees to assign to the Government the entire right, title, and interest throughout the world in and to each Subject Invention, except to the extent that rights are retained by the Participant under paragraphs C.(2) and D. of this article.

(2) Greater Rights Determinations. The Participant, or the employee-inventor with authorization of the Participant, may request greater rights than the nonexclusive license and the foreign patent rights provided in paragraph D. of this article on identified inventions in accordance with the procedure and criteria of 41 CFR 9-9.109-6. A request for a determination of whether the Participant or the employee-inventor is entitled to retain such greater rights must be submitted to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) at the time of the first disclosure of the invention pursuant to subparagraph B.(1) of this article or not later than 9 months after conception or first actual reduction to practice, whichever occurs first, or

ARTICLE B.XXIV - PATENT RIGHTS - SHORT FORM (Cont'd)

such longer period as may be authorized by the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) for good cause shown in writing by the Participant. The information to be submitted for a greater rights determination is specified in 41 CFR 9-9.109-6(e).

D. Minimum Rights to the Participant. The Participant reserves a revocable, nonexclusive, paid-up license in each patent application filed in any country on a Subject Invention and any resulting patent in which the Government acquires title. Revocation shall be in accordance with the procedure of subparagraphs C.(2) and (3) of the clause in 41 CFR 9-9.107-5(a). The Participant also has the right to request foreign rights in accordance with the procedures of paragraph (c)(4) of the clause in 41 CFR 9-9.107-5(a).

E. Employee and Subcontractor Agreements. Unless otherwise authorized in writing by the Contracting Officer, the Participant shall:

(1) Obtain patent agreements to effectuate the provisions of the Patent Rights article from all persons who perform any part of the work under this Agreement except nontechnical personnel, such as clerical employees and manual laborers.

(2) Unless otherwise authorized or directed by the Contracting Officer, the Participant shall include the Patent Rights article of 41 CFR 9-9.107-5(a) or 41 CFR 9-9.107-6, as appropriate, modified to identify the parties in any subcontract hereunder having as a purpose the conduct of research,

(3) Promptly notify the Contracting Officer in writing upon the award of any subcontract containing a Patent Rights article by identifying the subcontractor, the work to be performed under the subcontract, and the dates of award and estimated completion. Upon the request of the Contracting Officer the Participant shall furnish a copy of the subcontract to such requester.

F. Atomic Energy.

(1) No claim for pecuniary award or compensation under the provisions of the Atomic Energy Act of 1954, as amended, shall be asserted by the Participant or its employees with respect to any invention or discovery made or conceived in the course of or under this Agreement.

(2) Except as otherwise authorized in writing by the Contracting Officer, the Participant will obtain

ARTICLE B-XXIV - PATENT RIGHTS - SHORT FORM (Cont'd)

patent agreements to effectuate the provisions of subparagraph F.(1) of this article from all persons who perform any part of the work under this Agreement, except nontechnical personnel such as clerical employees and manual laborers.

G. Publication. In order that information concerning scientific or technical developments conceived or first actually reduced to practice in the course of or under the Agreement is not prematurely published so as to adversely affect patent interest of DOE, the Participant agrees to submit to the Patent Counsel for patent review a copy of each paper 60 days prior to its intended publication date. The Participant may publish such information after expiration of a 60-day period following such submission or prior thereto if specifically approved by Patent Counsel, unless the Participant is informed that in order to protect patentable subject matter, publication must be further delayed.

01021 Description of Work and Project Orientation

1. HILLTOP DIAMOND RING RANCH GEOTHERMAL DEMONSTRATION PROJECT OVERVIEW

1.1. Project Orientation

An aerial view of the Hilltop Diamond Ring Ranch, Figure 1.1., shows the location of most of the geothermal work area. Not shown is the second open feed lot shed and the owner's, Mr. Eugene Armstrong's, home. Figure 1.2. is a map of the area. The map and photo are shown in the same orientation, with north being more or less toward the top of the page. East-West Highway 34, is just out of view to the north, about 1/4 mile from the owner's home. The ranch buildings are about 5 miles west of the intersection of highway 34 and 14 or about 40 miles west of Pierre, SD. The land is a gently rolling terrain with the well and buildings lying along the crest of a north south oriented ridge.

1.2. General Description of the Geothermal Heating System

The dark lines in Figure 1.2. represent the trenching/pipeline required to heat the homes, barns, shop and grain dryer. These trenches are drawn in for descriptive purposes only and may or may not be that exact location. Figure 1.3. shows a simplified general layout of the heating system. The well water is relatively corrosive, necessitating a split system where the well water is used to heat a captive (closed loop) heating system with the cooled water being either discharged directly to a pond or pumped through two open feed lot sheds where any available heat is used to temper the air in these sheds and provide stock water. The well water will also be used to provide the domestic water supply. The closed loop system, will have a central pumping station located next to the main, well water/heating water, heat exchanger. This central pumping station will have five pumps providing heated water for:

- (1) Grain Dryer;
- (2) Shop, Employee's Home;
- (3) Mobile Homes, Hospital Barn;
- (4) Open Feed Lot Sheds;
- (5) Make up Water Pump.

A sixth pump for domestic water is presently located in the hospital barn, and will remain there.

Figure 1.3. shows only the heating system. Details are provided in the accompanying drawings.

Figure 1.1. Aerial View of Hilltop Diamond Ring Ranch.

HILLTOP DIAMOND RING RANCH GEOTHERMAL DEMONSTRATION

Figure 1.2. Map of Hilltop Diamond Ring Ranch.

Figure 1.3. Final Design for the Hilltop Diamond Ring Ranch Geothermal Heating System.

1.3. Electric Controls

Figure 1.4. shows the conceptual design for the home heating systems. Essentially there are two heat control systems, plus a water temperature controller.

The existing thermostat will signal the pump, via buried control wire, that a structure on that circuit needs heat. Thus the pump and blower fan are turned on simultaneously. If further heat is needed, the present conventional propane/fuel oil/electric, heating system cuts in. To limit response time, a thermostat is in the hot water supply line to keep the water supply warm.

Figure 1.4. Heating Controls, Diamond Ring Ranch Geothermal Demonstration

2. GENERAL DESCRIPTION OF WORK

2.1. Drawing System

Unless otherwise stated all work will be done as specified by the drawings. The project drawings are numbered sequentially, the letter designating only the paper size, the main drawings are:

- 033-01-00-00 Cover Drawing;
- 033-02-00-00 Piping;
- 033-03-00-00 Pump Room;
- 033-04-00-00 Grain Dryer;
- 033-05-00-00 Electrical;
- 033-06-00-00 Mobile Home Ductwork;
- 033-07-00-00 Owner's Home Ductwork;
- 033-08-00-00 Employee's Home Ductwork.

Any Subassembly for a particular drawing would be called out on the main drawing such as the following hypothetical assembly:

- 033-02-00-00 Pump Assembly;
- 033-02-01-00 Inlet Plumbing;
- 033-02-01-01 Suction Difussor.

Thus all Drawings are directly linked to the project (first three numbers), assembly, (next two numbers), Part, (next two numbers), and finally the detail (last two numbers). The detail information is normally referenced to an 'A' sized (8½" x 11") sheet that contains component specifications.

2.2. Trenching and Pipeline and Signal Wire Burial

All pipe will be covered by a minimum of six (6) feet of earth. Prior to covering the pipe, all pipe is to be pressure tested for leaks.

No unusual requirements other than extreme care when covering the PVC pipe are needed. The possible exception would be the grade requirement on the pipeline from the well to the grain dryer and from the grain dryer to the discharge point. The well water may precipitate metallic sulfides which may tend to clog the pipe if they collect in low spots. In addition, high spots would tend to de-gas the well water changing its chemistry which could promote scaling. Thus the grade from the well to the heat exchanger should be constant as would be the stretches from the grain dryer to the shop out the line from the shop to the main discharge point. All other lines can have high and low points as they will be pumping systems as opposed to gravity flow. Expansion of the pipeline should be considered to allow for a 100°F temperature change.

2.3. Heat Exchanger

The heat exchanger will be located in the northeast corner of the shop. This half of the building is of pole type construction, and no floor will be in that portion of the building to facilitate ease of construction. Concrete floor installation must be coordinated with owner.

All items except the main heat exchanger will be supplied by the contractor. South Dakota School of Mines and Technology will order the main heat exchanger due to delivery requirements.

2.4. Grain Dryer

Figure 2.1. shows the general arrangement of the grain dryer. Not shown in the drawings is the connection of the heat exchanger structure to the HABCO 700-C grain dryer. This is to be done by the contractor using sheet metal, to provide a reasonably air tight seal.

2.5. Home, Shop and Barn Heating Systems

The drawings provided show the main duct work and piping. The contractor has the option to change minor parts or arrangements to facilitate ease of installation or manufacture. Major changes must be cleared by RE/SPEC Engineering.

2.6. Electrical Wiring

All wiring must be done by existing codes and licenced electricians. Any substitution of parts or materials must be cleared through RE/SPEC Engineering. In addition to the electrical changes shown, relocation of the duct heater and associated electrical equipment will be required in the owner's home. Also a 110 volt 1ø wall outlet and incandescent bulb lighting must be provided at the mobile homes heat exchanger and in the lower portion of the grain dryer.

FIGURE 2.1. FINAL ASSEMBLY OF GRAIN DRYER AND HEAT EXCHANGER ENLCOSURE.

01300 Submittals and Substitutions

1.0 General

1.1 To insure that the specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the Engineer.

1.2 See General Conditions and Supplementary Conditions for contractual requirements for submittals.

1.3 See Pertinent section of these Specifications for individual submittals requirements.

2.0 Shop Drawings

2.1 Submit shop drawings, catalog cuts and brochures, wiring diagrams, etc., where required by the specifications and for all items and systems listed.

2.2 Submit seven (7) copies of shop drawings for approval to Engineer.

3.0 Substitutions

3.1 Engineers approval required:

A. The Contract is based on the materials, equipment, and methods described in the Contract Documents.

B. The Engineer will consider proposals for substitution of materials, equipment, or methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution.

C. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the Engineer.

D. Request for substitution shall be made prior to bid date.

3.2 "Or Equal"

A. Where the phrase "or equal or or equal as approved by Engineer" occurs in the Contract Documents, do not assume that material, equipment or methods will be approved as equal by the Engineer unless the item has been specifically approved for this Work by prior approval.

3.3 Manuals

A. Provide 2 sets of operation and maintenance manuals.

B. These manuals to include all manufacturer's recommended operation and maintenance information and one (1) set of shop drawings.

01400 TESTING

1.0 General

1.1 From time to time during the progress of the Work, the Owner may require that testing be performed to determine that materials provided for the Work meet the specified requirements.

1.2 Requirements for testing may be described in various sections of these Specifications.

2.0 Underground Piping

2.1 Test all underground piping as per manufacturer's recommendation.

2.2 Test all underground piping for leaks before piping is backfilled.

2.3 Test underground piping by filling pipe with water and pressure system to 30 lbs. System must be able to hold pressure for 4 hours.

3.0 Above ground Piping.

3.1 Test all above ground piping as per Uniform Mechanical Code.

3.2 Test above ground piping by applying 40 lbs. air pressure for 4 hours.

01500 TEMPORARY FACILITIES AND CONTROLS

1.0 The Contractor shall provide his own field office on the premises, maintain and remove same upon final inspection of the building by the Engineer. He shall equip the office with a telephone and file the number in the Engineer's office.

2.0 Sanitary Arrangements.

The Contractor shall provide sanitary toilet facilities in such number as may be required, and of such type as will meet the State's sanitary regulations during construction.

3.0 Electrical Power

The Owner will provide electrical energy for power and light as required for hand and small tool operation at building sites.

4.0 Cleaning

The Contractor shall at all times keep the job site clean of all debris and waste and keep all equipment in an orderly manner.

01600 MATERIALS AND EQUIPMENT

1.0 Variations from material specified. It is intended that materials or products specified by the name of the manufacturer or the brand name, or catalog reference, shall be the basis of the estimate and furnished under the Contract unless changed or approved as equal by the Engineer.

1.1 Should the Contractor propose to use any material or product other than that specified, he shall present outline specifications of the material or product to the Engineer for written approval seven (7) days before he includes it in his estimate.

01700 PROJECT CLOSE OUT

1.0 Upon completion of the job, the Contractor shall request a final inspection by the Engineer. Based upon the engineer's acceptance and the owner's acceptance final payment will be made.

01800 GUARANTEE

1.0 Except as otherwise stated in the specifications, all work shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment or workmanship for one year from the date of certificate of substantial completion.

DIVISION 2 SITE WORK

02010 EXCAVATION FOR STRUCTURES

1.0 Excavate to elevations and dimensions indicated, allow additional spaces as required for construction operations and inspections of foundations.

2.0 If suitable bearing is not encountered at the depth indicated on drawings for foundations, the Contractor shall immediately notify the Engineer; he shall not proceed further until instructions are given and necessary measurements made for purpose of establishing additional volume of excavation.

3.0 Where soil conditions will permit, footing trenches may be excavated to the exact dimensions of the concrete and side forms omitted. Place footings and foundations upon undisturbed and firm bottoms; fill with concrete any excess cut under footings and foundations. Fill excess cut under slabs with gravel and thoroughly compact.

02100 UTILITIES

1.0 Rules and regulations governing the respective utilities shall be observed in executing all work under this section.

2.0 Inactive and abandoned utilities encountered in excavating and grading operations shall be reported to the Engineer; they shall be removed, plugged or capped as directed by the Engineer. In absence of specific requirements, plug or cap such utility lines at least 3 feet outside of new building walls.

02200 Fill under Slabs and Footings

1.0 Where fill is required to raise the sub-grade for concrete floors to the elevations indicated on drawings, such fill shall be of earth or bank-run gravel, placed and compacted as specified. Either earth or bank-run gravel shall be used for fills not exceeding 12 inches deep; only bank-run gravel or other approved granular material shall be used for fills greater than 12 inches. The type and quality of material for fill shall be approved by the Engineer and the State Engineer.

2.0 Before depositing fill, remove all loam, vegetation and other unsuitable material from areas to receive fill. Do not deposit fill until the subgrade has been checked and approved by the Engineer. In no case shall fill be placed on a subgrade that is muddy, frozen or that contains frost. Deposit fill material in horizontal layers not exceeding 6 inches in depth before compacting. Spread fill evenly and compact with each layer by uniformly rolling, pneumatic tamping or other approved equipment to 95 per cent maximum density at optimum moisture content over the entire area.

02300 BACKFILLING FOR BUILDINGS AND STRUCTURES

1.0 Backfill against foundation walls only after the slab has been poured to support the top of the wall and approval of the Engineer has been obtained. The Contractor may request approval from the Engineer to backfill both interior and exterior foundation wall at the same time with fill progressing equal for both sides of wall. Place and compact backfill so as to minimize settlement and avoid damage to the walls and to waterproofing and other work in place.

2.0 Before placing fill, remove all debris subject to termite attack, rot or corrosion, and all other deleterious materials for areas to be back-filled. Deposit backfill in layers not more than 8 inches deep. All fill material shall be reasonably free from roots and unsuitable material. Stones larger than 4 inches, maximum dimension, shall not be permitted in the upper 6 inches of fill. Place the fill material in successive horizontal layers, in loose depths as specified for the full width of the cross section. Thoroughly compact each layer by rolling or pneumatic tamping after a light sprinkling with water. The finished subgrade shall be brought to elevations indicated and sloped to drain water away from the building walls.

02400 SITE GRADING

1.0 GRADES: Do all cutting, filling and compacting of fills and rough grading required to bring the entire project area, outside of buildings, to subgrades required by site plan.

2.0 FILLS: Where fill is required to raise the existing grades outside of building areas to the new subgrade elevation indicated on drawings, such fill shall be of earth, placed and compacted as specified.

A. Material for fill shall be reasonably free from roots, wood or other organic material. Fill under surfaced areas shall not contain more than 15 percent of clay or loam and no humus. Stones larger than 4 inches, maximum dimensions, shall not be used in the upper 6 inches of fill or embankment. Place the material in successive layers in loose depth as specified for the full width of the cross section. Deposit fill in layers not more than 8 inches deep under surfaced areas or 12 inches under lawn and planted areas.

B. Compact each layer of fill by rolling or tamping to 90 percent of maximum density at optimum moisture content.

3.0 ROUGH GRADING: Rough grading of all areas within the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes. All ditches, swales and gutters shall be finished to drain readily. Unless otherwise specified or indicated on drawings, the sub-grade shall be evenly sloped to provide drainage away from the building walls in all directions at a grade of not less than $\frac{1}{4}$ inch per foot. Provide roundings at top and bottom of bank and at other breaks in grade.

DIVISION 3
CONCRETE

DIVISION 3 CONCRETE

03100 CONCRETE FORM WORK.

1.0 Construct forms to slopes, line and dimensions shown, plumb and straight and sufficiently tight to prevent leakage; securely brace and shore forms to prevent displacement and to safely support construction loads. Provide access openings for cleaning and inspecting forms and reinforcing prior to depositing concrete. Do not coat forms with a material that will stain or cause injury to exposed concrete surfaces. Keep wood forms wet as necessary to prevent shrinkage. Forms for exposed concrete beams, girders, columns and pilasters shall provide for a 1 inch radius or flat bevel on external corners. Construct forms for beams, lintels and girders so that sides may be removed without disturbing bottom of form or its support.

2.0 Where soil conditions will permit excavation to accurate sizes without bracing, side forms for footings may be omitted and the sides of the excavation lined with waterproof paper, or a .006 inch thick polyethylene film.

3.0 Form ties used for exposed concrete surfaces shall be of type approved by the Engineer. They shall have a minimum working strength when fully assembled of at least 3,000 pounds. Ties shall be so adjustable in length as to permit complete tightening of forms and of such type as to leave no metal lugs, cones, washers or other devices to act as a spreader within the forms, or for any other purpose which will leave a hole or depression larger than 7/8 inch in diameter or a depression back of the exposed surface of the concrete.

4.0 The inside surfaces of wood board forms shall be soaked with clean water prior to placing concrete. Plywood or presswood forms shall be treated with an approved form oil or lacquer. If oil is used, all extra oil shall be wiped off with rags to leave the surface of the forms just oily to the touch. Concrete shall not be placed in any form until observed by the Engineer and permission is given to start placing.

03200 CONCRETE REINFORCEMENT

1.0 Reinforcing steel shall meet these specifications:

1.1 Reinforcing Bars: Bars shall be deformed in accordance with ASTM A305-56T or ASTM A408-58T and formed of either intermediate or hard grades of billet steel ASTM A15-58T, regular grade rail steel ASTM A16-59T, or intermediate or hard grade axle steel ASTM A160-57T. (Where indicated on drawings as requiring 60,000 psi minimum yield point, reinforcing bars shall be billet steel in accordance with ASTM A432-59T or rail steel in accordance with ASTM A15-58T special grade.) (Where indicated on drawings as requiring 75,000 psi minimum yield point, reinforcing bars shall be in accordance with ASTM A431-59T.) Reinforcement shall be clean and free from loose rust, scale or other coatings that will reduce bond.

1.2 Welded Wire Fabric Reinforcing: (ASTM A185-61T) Steel wire spotwelded at intersections, and of size indicated.

2.0 Placing Reinforcement

A. Place reinforcement accurately in position shown, securely fasten and support to prevent displacement before and during pouring. Cleaning, bending, placing and splicing of reinforcement shall be done in accordance with requirements of the Building Code and approved shop drawings. Mesh reinforcement in slabs shall have sides and ends lapped not less than one mesh.

3.0 Inserts and Fastening Devices for Other Work:

A. Provide for installation of inserts, conduit, pipe sleeves, drains, hangers, metal ties, shelf angle supports, anchors, bolts and angle guards, stair nosings, dowels, thimbles, anchor slots, metal reglets nailing strips, blocking, grounds and other fastening devices required for attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is poured.

B. All sleeves, chases, inserts, hangers, etc., which are provided and placed in the forms by the various trades shall be maintained in position and protected until the concreting is completed.

10. Control Test for Concrete

10.1 Testing Laboratory: The Owner will retain the services of a testing laboratory and pay all costs. The Contractor shall take the sample and deliver same to testing laboratory. Any testing required because of failure of concrete to meet specification requirements shall be paid for by the Contractor and shall not be included in his proposal.

10.2 Extent of Tests: The Contractor will take samples and make tests hereinafter listed for each 50 cubic yards of fresh concrete or fraction thereof placed in the project, but not less than one set for each day of concreting.

10.2.1 Compression and Strength Tests: Each test shall consist of three standard 6 inch by 12 inch cylinders; one cylinder to be tested at the age of 7 days and two cylinders at the age of 28 days. Samples from which compression test specimens are molded shall be secured in accordance with ASTM C172-54. Specimens made to check the adequacy of the design for strength of concrete, or as a basis for acceptance of concrete shall be made and laboratory cured in accordance with ASTM C31-69. Strength tests shall be made in accordance with ASTM C39-61.

10.3 Enforcement of Strength Requirements

When the ultimate compression strength of any cylinder falls below the specified strength for the class of concrete specified, the design mix and water content shall be adjusted to produce the specified strength for concrete that is subsequently placed. In addition, the Engineer may order additional curing for that portion of the structure where the questionable concrete has been placed.

10.3.1 In the event that such additional curing does not give the strength required, as determined by load test made in accordance with

DIVISION 3

ACI 318-77, or cured cylinder tests, and if such tests indicate the necessity, the defective parts shall be removed and replaced or shall be reinforced as directed by the Engineer, at the Contractor's expense including the expense of the tests. If such tests indicate that the structure adequately meets the requirements of the specifications and Uniform Building Code, the test results of the defective cylinders will be waived and the costs of these tests will be paid by the Contractor.

03300 CAST-IN-PLACE CONCRETE1.0 Materials

1.1 Portland Cement: ASTM C150-60, Air Entraining Portland Cement C175-60; the cement for the structures in contact with the soil shall conform to Type II cement (ASTM C-150); Portland Blastfurnace slag cement ASTM C205-61T, or Portland Possoland Cement ASTM C340-58T.

1.2 Sand: Clean, hard natural sand, or manufactured sand, or a combination of both and conforming to ASTM C33-59.

1.3 Coarse Aggregate: Except as otherwise specified, aggregate shall be hard, durable, uncoated crushed stone, air-cooled blast furnace slag or gravel conforming to ASTM C33-61T.

A. Maximum size aggregate allowed is $1/5$ of narrowest dimension between forms of concrete member, or $3/4$ minimum clear spacing between reinforcing bars, or as recommended in ACI Standard No. 614-54.

B. For concrete having an exterior surface exposed, 95 to 100% shall pass a $1\frac{1}{2}$ inch sieve; 35 to 70% shall pass a $3/4$ inch sieve, 10 to 30% shall pass a $3/8$ inch sieve and not over 5% shall pass a No. 4 sieve. Percentages are by weight.

C. For applied cement finish, except exposed aggregate finish, use $1/8$ inch minimum and $3/8$ inch maximum size aggregate, except as specified otherwise.

1.4 Mixing Water: Clean and free from oil, acid and injurious amounts of vegetable matter, alkalies and other impurities.

2.0 Strength, Proportions and Consistency of Concrete:

2.1 All Building Construction concrete shall have the compressive strength at 28 days of 4,000 psi. Exterior concrete shall be 3,000 psi (sidewalks, curbs, etc.).

3.0 Mixing Concrete

3.1 Concrete shall be ready-mixed or job-mixed at the Contractor's option, and in accordance with requirements of the American Concrete Institute Building Code 318-77, Chapter 5, and the Uniform Building Code.

3.2 The placing or depositing of all concrete shall be done in accordance with requirements of the American Concrete Institute Building Code 318-77 and as modified herein. Concrete shall be rapidly handled

from mixer to forms and deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. Concrete shall be spaded and worked by hand and vibrated to assure close contact with all surfaces of forms and reinforcement and leveled off at proper grade to receive finish. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work, nor shall re-tempered concrete be used. All concrete shall be placed upon clean, well-thawed, damp surfaces, free from water, and never upon soft mud or dry porous earth.

3.3 Concrete shall be placed with the aid of mechanical vibrating equipment. Vibration shall be applied directly to the concrete unless otherwise approved by the Engineer.

3.4 Vibration shall be applied at the point of deposit and in the area of freshly placed concrete. It shall be of sufficient duration to accomplish thorough compaction and complete embedding of reinforcement and fixtures but shall not be long enough to cause segregation of the mix.

4.0 Protection and Curing

4.1 Protect concrete against rapid drying and keep moist for at least 6 days after placing; during this period, concrete shall be maintained above 70°F. for at least 3 days or above 50°F. for at least 5 days. Concrete from which forms are removed within 6 days after concreting, and cement finishes shall be sprayed during this curing period as frequently as drying conditions may require. Cover cement finishes with mats, waterproof paper or other approved membrane within 24 hours after finished and maintain in good condition until the installation of permanent floor covering or until directed.

4.2 The methods and recommended practice as described in ACI Standard 604-77 shall be followed for protecting and curing concrete in cold weather and in hot weather.

5.0 Removal of Forms

5.1 Forms shall be removed in accordance with requirements of the ACI Building Code Requirements for Reinforced Concrete No. 318-77, Chapter 6, without damage to concrete and in a manner to insure complete safety of the structure.

6.0 Patching Formed Surfaces of Exposed Concrete

6.1 After the forms have been removed, all concrete surfaces shall be inspected and any pour joints, voids, stone pockets or other defective areas not permitted by the Engineer shall be patched, and all tie holes, shall be patched before the concrete is thoroughly dry.

7.0 Finishes

7.1 Trowel finishes: Apply hard trowel finish to all exposed concrete floors.

8.0 Cleaning Finish Exposed Concrete Surfaces.

8.1 In the event that efflorescence, stains, oil, grease, or any unsightly accumulation of foreign materials are visible on the exposed surfaces of finished concrete, the Engineer may require remedial action to remove these blemishes. Such action may cover all exposed concrete, or when irregular lapping can be avoided, only such parts as are affected by the stains or other unsightly appearances. Cleaning shall proceed as follows:

8.2 Remove oil and grease with detergents and scrubbing and thoroughly wash with water. While the surface is wet, apply a grout coat of cement and fine sand mixed 1 to 1½. Immediately float surface with cork or other suitable floats to fill any holes. While the grout is plastic, finish with a sponge rubber float, removing excess grout. This shall be done when grout will not be pulled from holes. Allow surface to dry thoroughly, then rub with dry burlap to remove all dry loose grout. Complete all cleaning on any section in one day, leaving no loose grout on the surface overnight.

8.3 Spots or streaks remaining may be honed dry but lightly so as not to change the texture of the concrete.

9.0 Depositing Concrete

9.1 Preparation: Before placing concrete, all debris and water shall be removed from the places to be occupied by the concrete. Wood forms shall be thoroughly wetted or oiled, and the reinforcement cleaned. Formwork and the placement of reinforcement, pipes, sleeves, conduit, hangers, anchors and other inserts shall be inspected and approved by the Engineer.

10.0 Storage of Materials

10.1 Store bagged cement on platforms off ground; protect stored cement against the elements. Handle and store fine and coarse aggregates separately in a manner to prevent intrusion of foreign material. Protect all reinforcement until used. Do not use any frozen materials or any hardened cement.

11.0 Concrete Protection for Reinforcement The metal reinforcement shall be protected by the thickness of concrete indicated on the plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

Where concrete is deposited against ground without the use of forms, there shall be no less than three (3) inches clear to the steel.

DIVISION 3

Where concrete is exposed to the weather, or exposed to the ground but is placed in forms, not less than two (2) inches for bars more than $5/8$ inch in diameter and $1\frac{1}{2}$ inch for bars $5/8$ inch or less in diameter.

In slabs and walls not exposed to the ground or to the weather, not less than $3/4$ inch.

In beams, girders and columns not exposed to the ground or to the weather, not less than $1\frac{1}{2}$ inch.

In all cases, the thickness of concrete over the reinforcement shall be not less than the diameter of round bars.

DIVISION 5 METALS

05100 STRUCTURAL METAL FRAMING

1.0 Materials

1.1 Structural Steel: Structural Steel for all work shall conform to ASTM A36-61T.

1.2 Evidence of Conformity: Certified test reports of structural steel shall constitute sufficient evidence of conformity with the specifications. Manufacturer's certification for bolts and nuts and filler material for welding shall constitute evidence of compliance.

2.0 Fabrication of Steel

2.1 Fabrication of structural steel shall be in accordance with the American Institute of Steel Construction - "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", latest edition, and the Uniform Building Code.

3.0 Erection of Steel

3.1 Applicable standards: Erection of structural steel shall be in accordance with the American Institute of Steel Construction - "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", latest edition; "Code of Standard Practice for Steel Buildings and Bridges", latest edition.

4.0 Painting

4.1 Shop Painting: After inspection and approval and before leaving the shop, thoroughly clean steel of all loose mill scale, rust, spatter, slag or flux deposit, oil, dirt and other foreign matter. Apply one shop coat of red lead paint or approved rust resistive paint to all steel surfaces except machined surfaces, surfaces which are to be encased in concrete, surfaces to receive sprayed-on fireproofing, and edges and surface areas adjacent to field welds. Parts inaccessible after assembly or erection shall be given two coats of different colors. Surfaces must be dry when paint is applied. Protect machined surfaces from corrosion by a suitable coating. Remove paint from surfaces to be welded for a distance of 2 inches on either side of joint.

4.2 Field Painting: After erection, touch-up field connections and abraded places with same type of paint as used for shop coat.

4.2 All pump bases and support brackets shall be constructed as herein specified. They shall all be painted.

DIVISION 6 WOOD

06100 Rough Carpentry

1.0 Workmanship

1.1 All rough carpentry shall produce joints true, tight and well-nailed with all members assembled in accordance with the Drawings and with all pertinent codes and regulations.

1.2 Selection of lumber pieces: Carefully select all members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.

1.3 Cut out and discard all defects which will render a piece unable to serve its intended function.

1.4 Shimming: Do not shim any framing component.

2.0 General Framing

2.1 General: In addition to all framing operations normal to the fabrication and erection indicated on the Drawings, install all wood backing required for the work of other trades. Set all horizontal and sloped members with crown up. Do not notch, bore, or cut members for pipes, ducts, conduits, or other reasons except as shown on the Drawings or as specifically approved in advance by the Architect.

2.2 Bearings: Make all bearings full unless otherwise indicated on the Drawings. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

3.0 Installation of Plywood Sheathing

3.1 Placement: Place all plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise specifically shown on the Drawings. Center joints accurately over supports, unless otherwise specifically shown on the Drawings.

3.2 Protection of plywood: Protect all plywood from moisture by use of all required waterproof coverings until the plywood has in turn been covered with the next succeeding component or finish.

4.0 Fastening

4.1 Nailing

A. Use only common wire nails or spikes of the dimension shown on the Nailing Schedule, except where otherwise specifically noted on the Drawings.

B. For conditions not covered in the Nailing Schedule, provide penetration into the piece receiving the point of not less than $\frac{1}{2}$ the length of the nail or spike, provided, however, that 16d nails may be used to connect two pieces of two inch (nominal) thickness.

C. Do all nailing without splitting wood. Prebore as required. Replace all split members.

4.2 Bolting:

A. Drill holes 1/16" larger in diameter than the bolts being used.

06101 Materials and Standards

1.0 In addition to complying with all pertinent codes and regulations, all materials of this Section shall comply with the pertinent provisions of:

1.1 Douglas Fir, Hemlock and Cedar: "Standard Grading and Dressing Rules for West Coast Lumber", Number 16, as published by the West Coast Lumber Inspection Bureau.

1.2 Plywood: "Softwood Plywood - Construction and Industrial" (amended June 1969), Product Standard PS 1-66 of U.S. Department of Commerce, Bureau of Standards.

1.3 Rough hardware: "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.

1.4 Other: Similar and pertinent reference standards for the products needed.

2.0 Conflicting requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these Specifications, the more stringent provisions shall govern.

3.0 Grade Stamps

3.1 Framing Lumber: Identify all framing by the grade stamp of the West Coast Lumber Inspection Bureau or such other grade stamp as is approved in advance by the Engineer.

3.2 Plywood: Identify all plywood as to species, grade, and glue type by the stamp of the American Plywood Association.

3.3 Other: Identify all other materials of this section by the appropriate stamp of the agency listed in the reference standards, or by such other means as are approved in advance by the Engineer.

DIVISION 7
THERMAL AND MOISTURE
PROTECTION

DIVISION 7 THERMAL AND MOISTURE PROTECTION

07200 Insulation

1.0 General: All building insulation shall be the product of Owens/Corning Fiberglass, or an equal approved by the Engineer.

2.0 Other Materials: All other materials such as fasteners and retainers, not specifically described but required for a complete and proper installation of the building or structure insulation, shall be as selected by the Contractor subject to the approval of the Engineer.

DIVISION 15
MECHANICAL

DIVISION 15 MECHANICAL

15010 General Provisions

1.0 General

1.1 The provisions of the General Conditions, Supplementary Conditions, Division 1 and other pertinent sections of this specification shall apply to the Work of this section. It is the intent that this section is a part of this specification, and as such, is subject to all its provisions.

1.2 Reference is made in this section to the General Conditions of the Contract for Construction. This is done for the convenience of the Contractor and is not intended in any way to limit the applicability of the General Conditions. The Contractor is advised to become familiar with this document.

1.3 Temporary heat and utilities shall be provided as required herein and/or by Division 1.

1.4 Definition: "Provide" shall mean that the Contractor shall furnish and install.

2.0 Coordination and Cooperation.

2.1 See General and Supplementary Conditions.

2.2 The Contractor shall coordinate the work and requirements of the Construction Documents with his work, subcontractors, servicing utilities, suppliers, administrative officials, the owner and all other parties involved in this project to insure cooperation, expeditious and quality construction in the best interests of the owner. Materials and equipment shall be ordered, delivered and installed on a cooperative basis so as to not interfere with or hold up the work of other trades.

2.3 Duct locations take precedence over pipe and conduit. The Contractor shall correct without charge to the Owner, any work requiring alteration due to lack of proper supervision, coordination or failure to make proper provisions in time. Equipment too large to pass through building openings shall be installed prior to the closing of such spaces. Dimensions shall be verified with the actual construction.

3.0 Codes and Standards

3.1 This Work shall comply with all pertinent codes and regulation (see also General Conditions). The latest or current applicable editions legally in force shall be used.

3.2 Compliance with, but not necessarily limited to, the following shall be required as pertinent:

- Life Safety Code (NFPA 101)
- South Dakota Plumbing Code
- National Electric Code (NFPA 70)
- South Dakota Electric Code
- Uniform Building Code (UBC)
- South Dakota State Fire Marshal requirements
- Applicable NFPA Publications
- Requirements of the Servicing Utilities
- Manufacturer's Installation Instructions

3.3 The Contractor shall familiarize himself with all applying codes, standards and regulations, etc. and the Contract Documents.

3.4 Standards of quality and performance of the codes, etc., shall be the minimum requirements of this work. When the requirements of the Contract Documents are more rigid than the requirements of the applying codes and regulations, or when there is a conflict between codes, regulations, etc., the more rigid standard shall be adhered to. Where the provisions of pertinent codes and standards conflict with the Contract Documents, the more stringent provisions shall govern.

3.5 The Contractor shall obtain, in writing, clarification of any unclear requirements, intent, or conflicts of these Contract Documents from the Engineer before proceeding with the work, preferably before bidding.

4.0 Adjusting, Balancing, Testing, Servicable Condition.

4.1 The Contractor shall provide, as part of this agreement, all necessary adjusting, balancing, etc. as required to provide for its proper operation under normal operating conditions likely to be encountered, by local Building Officials, the applying codes, servicing utilities and as required by the Architect to verify compliance with these plans and specifications.

4.2 All malfunctioning or defective equipment and/or material shall be replaced or corrected to the satisfaction of the Owner, his representative or the local Building Officials.

4.3 All equipment shall be oiled, greased, adjusted, cleaned, leveled, aligned and generally be put in servicable condition as required for its proper operation prior to final acceptance, testing and/or operation.

4.4 Systems requiring a period of operational adjustment or seasonal conditions (for example, air conditioning cooling systems installed in the winter) for testing and adjusting shall be provided by the Contractor immediately when the proper conditions are encountered.

4.5 All air distribution systems shall be adjusted for the maximum comfort of the occupants, to avoid drafts or excessive blowing on the occupants and for the lowest possible noise levels. The majority of the balancing of the air distribution system by the Contractor shall be with the duct dampers, leaving the outlet damper adjustments for final adjustments of for owner's adjustment during occupancy. Locate adjusting dampers as far away from the outlets as possible for noise control. All duct balancing dampers shall be adjustable from the outside of the duct and shall be marked to indicate open or closed position and lockable in position.

4.6 The Engineer shall be notified as to the time when the testing is to be made in sufficient time to allow him to watch the same if he so desires.

4.7 All pipe and duct openings shall be closed with caps or plugs during installation. All fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. At completion, all work shall be thoroughly cleaned and all residue removed from inside surfaces. Exterior surfaces of all materials and equipment shall be cleaned and delivered in a perfect unblemished condition. Ducts shall be thoroughly cleaned.

5.0 Licenses, Permits, Fees and Inspections.

5.1 The Contractor shall make application, obtain and pay for all required licenses, permits, fees, inspections, certifications, taxes, etc. as required for the completion of this Work.

6.0 Accessibility to Valves, Controls, Etc.

6.1 All valves, dampers, control and operating devices, thermometers, gauges, traps, cleanouts and/or other specialties requiring reading, maintaining, adjusting, inspection, repairs, removal or replacement shall be installed in a convenient and accessible location, in consideration of these requirements. Provide access doors or panels in walls and ceilings as required for access to control devices, traps, valves, etc. The fire rating of these doors or panels shall be the same rating as the walls or ceiling in which it is installed. Coordinate the requirements of access doors with other trades to avoid unnecessary duplication.

6.2 Arrange all piping, ducts, electrical wiring, etc., to provide clearance for removal of access doors, equipment, controls, etc., and clearances for windows and doors.

6.3 Provide valves and unions in piping to allow service or equipment removal with a minimum of dismantling and inconvenience.

6.4 The layout of and installation of all equipment and material shall be such that connecting and disconnecting of piping, wiring, accessories, etc., can be readily accomplished for inspection, service, repair or replacement.

7.0 Openings, Chases, Etc.

7.1 Provide all openings, chases, sleeves, inserts, anchor bolts, etc. in construction as required for this work in accordance with system requirements and applicable codes.

7.2 The Contractor shall provide all roof curbs, equipment supports and flashing for all equipment. All exterior openings, penetrations of water-proof or moisture membranes, roof, etc. for conduit, etc., vent pipes, ducts, equipment etc. shall be sealed, provided with approved flashing and/or counterflashing and made weatherproof and in compliance with the required clearances and applying regulations.

7.3 All exterior openings exposed to the weather shall be flashed in such a manner as to make them weatherproof. All flashing and counter-flashing when of metal shall be of not less than No. 26 U.S. gauge corrosion-resistant metal.

7.4 Draft and Firestopping shall be provided as required by applying codes (including, but not limited to, UBC Section 2517-f and 3707-a).

7.5 Pipes and conduits embedded in masonry shall comply with the requirements of UBC Section 2417-f.

7.6 Pipes and conduits embedded in concrete shall comply with the requirements of UBC Section 2606-C.

7.7 Cutting and Patching: As the work progresses, provide for the necessary openings, holes, chases, etc. in their correct location. If the necessary openings, etc., are not in their correct location, make the necessary corrections at no cost to the Owner. Cut existing work and patch only as necessary to properly install the new work. Excess cutting and patching shall be avoided. Cutting structural members shall be made only with the specific approval of the Engineer.

8.0 Examination of the Site

8.1 It shall be the responsibility of the Contractor to examine the site for any obstacles and other features that may effect the work of this project before submitting a bid.

9.0 Quality Assurance

9.1 Qualifications of Installers: For the actual fabrication, installation, and testing of work under this Section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of the installers. Workmen shall be qualified as required, or licensed, by law as applies.

9.2 Workmanship:

A. All work shall be installed in a neat and workmanlike manner, using only workmen thoroughly skilled in the trade or duties they are to perform. All work shall be completed as necessary for the purposes for which it is intended. Workmanship shall conform to generally accepted good practice. This Contractor shall staff the project with a sufficient number of skilled workmen, including a fully qualified construction superintendent, to complete the work in the time allotted.

B. All work not approved by the Engineer and/or Building Official as being in compliance with these requirements and accepted practice shall be corrected as required at the Contractor's expense.

9.3 Install power driven equipment and motors to be quiet and free of vibrations. Construct and brace metal partitions, ducts, sheet metal housings, etc. to prevent vibration or rattling when the system is in operation. Design and construct connections to equipment so noise and vibration will not reach the conditioned area through ducts, piping, conduit, sheet metal work, or the building construction. Provide power driven equipment suspended from the structure with vibration isolation methods. Provide flexible duct connections on air conditioning units.

9.4 Compliance with Specifications:

A. Whenever required during progress of the work and after completion of construction, immediately furnish proof acceptable to the Owner that all work installed is equal or exceeds all requirements specified for this work. In the event that such proof is not available, or is not acceptable to the Owner,, the Owner may require the Contractor to remove the work and replace with work meeting the specified requirements and to repair all damage caused in the removal and replacement, all at no cost to the Owner.

B. Any changes or deviation from the plans and specifications must be approved and confirmed in writing by the Engineer before the change is made. All specialties must be installed as detailed on plans. Where details or specific installation specifications are not included herein, approved manufacturer's recommendations shall be followed.

C. See General Conditions.

10.0 Submittals

10.1 Shop drawings shall be submitted on all equipment and insulation. See General Conditions.

10.2 Maintenance Manual: Prior to the completion of the project, the Contractor shall compile a complete equipment and maintenance manual showing the following information for the equipment supplied;

- name, model and manufacturer
- complete parts list and drawing
- name and telephone number of the local supplier of parts and service organization.

Bind the maintenance manual within a hard cover. Include the manufacturer's operating and maintenance instructions.

11.0 Equipment - General

11.1 All equipment shall conform to and be installed in accordance with the standards and requirements of the applying codes and as otherwise required herein. The Contractor's attention is called to the Uniform Mechanical Code (Chapter 5).

11.2 Equipment shall be accessible for inspection, service, repair and replacement without removing permanent construction.

12.0 Owners Instruction

12.1 The Owner or his agent shall be instructed by the Contractor on the proper operation and maintenance of all aspects of the building systems prior to final project approval. The Owner's Manual shall be used in this instruction. The Engineer shall be notified in sufficient time as to when and where the instruction shall take place and allowed to witness the same at his option.

13.0 Utility Connections, Modifications and Service Interruptions

13.1 This Contractor shall, as part of his agreement, provide the utility service connections to the building as shown on the drawings or required in these specifications. All connections shall be coordinated and in compliance with the servicing utility requirements. It is the responsibility of the Contractor to verify the exact location of connections and obstacles before submitting a bid.

13.2 When areas of the existing buildings are adjacent to the area of construction in which work is going on and are occupied, then the Contractor shall arrange his work so as to reduce to a minimum the periods of interruption or outages in the various services.

13.3 Not less than 24 hours before any system is to be put out of service, the Contractor shall notify the Owner of such necessity including the extent of the work to be done during the outage, possible length of time required for that phase of the work, and the desired time at which the outage is to begin. The Owner will make all arrangements with those affected, and where necessary he will dictate and specify the time of beginning, and other regulations governing each particular outage, so that inconveniences to the occupants will be minimized.

14.0 Electrical Work

14.1 Provide the electrical service and electrical connections required for all items of equipment provided for under this contract, and requiring such connections as shown on the Electrical drawing and as required in these specifications.

14.2 All starters and disconnects shall be provided by the Contractor except where furnished as an integral part of the equipment. All motors shall be provided with the equipment that they drive. Coordinate requirements with the supplier of such equipment.

14.3 All changes in electrical requirements, (increased wire size, conduit size, disconnects and/or starters etc.) made necessary due to the installation of larger motors or additional equipment other than originally specified shall be the responsibility of the Contractor.

14.4 All temperature control wiring shall be provided by the Contractor. All control wiring shall be concealed and in compliance with the National Electric Code.

15020 EXCAVATION AND BACKFILLING1.0 Excavation

Excavate trenches for underground pipelines to required depth by grade, codes and plans. Tamp bottom of trenches in fill areas to secure proper grade.

When rocks are encountered, excavate 6" below bottom of pipeline, fill back and tamp.

2.0 Backfill

Backfill material shall consist of sand, gravel, or materials free of rocks or trash, lumber, or debris.

Backfill in 12" lifts with material of proper moisture content. Compact material to density of existing area. Allow extra material for shrinkage.

15050 BASIC MATERIALS AND METHODS1.0 General Requirements

Materials shall conform to the standards cited in the South Dakota Plumbing Code and Uniform Mechanical Code.

All materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved, including the appendices of standards, and in strict accordance with the manufacturer's instructions.

2.0 Pipe and Pipe Fittings

2.1 Cover or plug openings in pipes, drains, fittings and equipment during construction to keep the system free of foreign matter.

2.2 All pipe fittings shall be installed as per manufacturer's instructions.

2.3 All piping shall be run true and parallel or at right angles with the building structure and arranged to pitch or drain as required for the service intended. Keep piping free from sags and unnecessary bends. Piping shall be offset as required to maintain clearances. Use pipe fittings for all offsets and changes of direction in piping. Do not spring, bend or force pipe into place.

3.0 PROTECTION OF PIPES

3.1 Pipes passing under or through walls shall be protected from breakage. Pipes passing through or under cinder or concrete or other corrosive material shall be protected against external corrosion by protective coating, wrapping, or other means which will prevent corrosion.

3.2 Structural members shall not be weakened, cut or otherwise impaired except as permitted by the Engineer.

3.3 Adequate freeze protection shall be provided for all water, soil, or waste pipe outside of a building, in an exterior wall or unheated space.

4.0 JOINTS AND CONNECTIONS

All joints and connections between pipes shall be made with proper fittings installed as per manufacturer's instructions and prevailing codes. All mechanical joint or slipjoint fittings shall be blocked or held with rods.

5.0 PIPE MATERIAL

5.1 All underground piping from wellhead to grain dryer and heat exchanger shall be Johnsmanville Permastrand with slip joint fittings or saddle connections. All fittings underground shall be anchored and blocked.

5.2 All underground closed system piping from heat exchanger to buildings shall be PVC water pipe SDR 21, manufactured to ASTM D 2241. All fittings underground shall be gasketed or saddle fittings. All fittings shall be anchored and blocked.

5.3 All above ground piping 3" and smaller shall be PVC Schedule 40 compound 1120, ASTM D, Grade 1, type 1. All fittings shall be solvent weld.

5.4 All above ground piping on closed loop system may be Schedule 40 black pipe with cast iron fittings for 2" and smaller. All piping above 2" shall be weld fittings.

All above ground piping unclosed loop system may be copper L with sweat fittings.

5.5 All above ground piping for primary water to grain dryer and heat exchanger shall be same as 5.3 with no exceptions.

6.0 VALVES

6.1 Pinch Valves shall be Grigsby #1-100 or approved equal.

6.2 Gate Valves shall be Nibro Scott T-121 threaded 1/2" thru 2" Gate Valves, 2 1/2" and larger shall be Nibro Scott #F-617-O. Or approved equal.

6.3 Ball Valves shall be Appollo Series 70 with handles or approved equal.

6.4 Check Valves 2" and smaller shall be Nibro Scott T-413-B, 2 1/2" and larger shall be Nibro Scott F-918-B, or approved equal.

7.0 HANGERS AND SUPPORTS

7.1 Plumbing system piping shall be installed without undue strains or stresses and provision shall be made for expansion, contraction and structural settlement. Piping, (and its contents and insulation), shall be supported at sufficiently close intervals to keep it in alignment, carry its weight and prevent sagging. Hangers, anchors and supports shall be firmly connected to the structure of the building, and shall not be suspended from other pipes or direct structures.

7.2 Hangers shall be located near or at changes in piping direction and concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage: they shall allow for expansion and contraction of piping.

8.0 EXPANSION

8.1 Provisions shall be made as shown on the drawings and as required for pipe expansion and contraction by the proper use of swing joints, expansion joints, expansion loops, expansion guides, and the location of anchors. All pipe shall be installed as per manufacturer's instructions.

8.2 Pipe anchors shall be located to separate the expanding sections of pipe to limit the amount of traverse between anchor points which each expansion joint can absorb. Anchors shall be provided at blind ends, changes in pipe direction, major branch connections, etc. to compensate for thermal growth and contraction. Never install more than one expansion joint between the same two anchors in any straight section of pipe. If expansion loops are used in the same line with expansion joints, the section containing the loop shall be isolated, by means of an anchor, from the section with an expansion joint.

8.3 Guides shall be used to allow for pipe movement. Guides shall be standard spider type which consist of a sleeve within a framework which is in turn rigidly fastened to a firm part of the installation and permits the pipe line to freely move along its axis. Pipe hangers, U-bolts or roller supports shall not be used in place of a pipe guide. The expansion joint shall be located as close as possible to an anchor and that the first guide be placed a maximum of fourteen pipe diameters from the first guide. The manufacturer's installation and application instructions shall be followed. Anchors, guides and expansion joints shall be Metraflex or equal (Zalles, Keflex, Thermo Tech, or American Tube).

9.0 FLEXIBLE COUPLINGS

Flexible pipe coupling shall be Flexonics Division, model number as specified on drawing, or approved equal.

15180 INSULATION

Not used.

15600 HEAT GENERATION

- 1.0 Geothermal Well. Well and wellhead for by owner, contractor to make connections as per plans.
- 2.0 Heat Exchanger: Heat exchanger supplied by owner. Contractor to set unit and make all connections.
- 3.0 Heating Coils. Heating Coils shall be Trane or approved equal. Size as per plans.
- 4.0 Unit Heaters: Unit Heaters shall be Trane or approved equal. Size as per plans.
- 5.0 Circulating Pumps. Hot water circulating pumps shall be Bell and Gossett or approved equal.
- 6.0 Condensate Pump shall be Dunham Bush, or approved equal. Size as per plans.
- 7.0 Heating Specialties
- 7.1 Calibrated Circuit Setter shall be Bell & Gossett or approved equal. Size as per plans.
- 7.2 Suction Diffusers shall be Bell & Gossett or approved equal. Size as per plans.
- 7.3 Expansion Tank shall be Ex-Trol or approved equal. Size as per plans.
- 7.4 Pressure reducing valve shall be Bell & Gossett or approved equal. Size as per plans.
- 7.5 Provide all other heating specialties as shown on plans.

15800 AIR DISTRIBUTION

- 1.0 The ductwork shall be provided in accordance with SMACNA "Low Velocity Duct Construction Standards". All ductwork shall be constructed of galvanized steel in accordance with Table 1 and Plate 5 through 15 of the Low Velocity Duct Standards.
- 2.0 Radius elbows shall be constructed in accordance with Plate 21 of the Low Velocity Duct Standards. Vaned elbows shall be vaned construction in accordance with Plate 22 of the Low Velocity Duct Standard. All elbows shall be long radius elbows or have turning vanes.
- 3.0 The hangers and supporting system shall be in accordance with Plates 16 through 20 of the Low Velocity Duct Standards.

15900 CONTROLS AND INSTRUMENTATION BY ELECTRICAL

16010 GENERAL PROVISIONS1.0 General

The provisions of the General Conditions, Supplementary Conditions, Division 1 and other pertinent sections of this specification shall apply to the Work of this Section. It is the intent that this Section is a part of this specification, and as such is subject to all its provisions.

The applicable portions of Section 15A (Mechanical) shall apply to this section. See also Section 2.6 of Division 1.

Temporary utilities shall be provided as required herein and/or by Division 1. Coordinate all power outages with owner.

All outside equipment shall be approved for such service.

2.0 Electrical Shop Drawings Required

Shop drawings shall be submitted on the following:

1. All scheduled equipment, light fixtures.
2. Safety and disconnect switches, panelboards, motor starters.
3. All devices.
4. All controls.

3.0 Inspection

All electrical work shall be inspected as required by Code. A copy of the inspection report shall be provided to the Engineer prior to final approval.

All panelboards and disconnects shall be permanently labeled with function, size (voltage, phase, amps) and feeder wire size. Label the function of remote switches.

16100 BASIC MATERIALS AND METHODS1.0 General

All materials shall be new, shall meet the requirements of the applicable standards of UL and the NEC. All work shall be in strict compliance with the NEC.

All conduits passing through exterior walls or the roof shall be weatherproofed.

Conduit installed on equipment shall not cover access doors, controls, removable panels, etc., or otherwise hinder normal maintenance and repair of the equipment. Flexible couplings shall be used on equipment mounted on vibration mounts.

2.0 Outlet Locations

Unless otherwise noted, boxes for the following outlets shall be located with their center lines at elevations above the finished floor (unless over work counters, then as required) as follows:

<u>DESCRIPTION</u>	<u>MOUNTING HEIGHTS</u>
Switches	4'-0"
Receptacles	1'-0" or 8" above counter tops
Exit Lights	7'-6" or above
Thermostats	5'-0"
Panels	6'-6" to top maximum
Telephone Outlets	1'-0"

No switches shall be located behind doors when the door is open.

Contractor shall exercise extreme care and verify exact location and height of electrical equipment prior to installation.

Consult the Engineer for heights of any outlets not specifically mentioned. The above listed heights are nominal values, and may be adjusted slightly to fit varying conditions such as brick and block courses.

3.0 Grounding

All equipment shall be grounded as required by the latest edition of the National Electric Code.

4.0 Raceways

Conduit shall be used as required by the NEC and as shown on drawings.

Rigid steel conduit shall be used wherever subject to mechanical injury and as required by NEC. All conduit shall meet or exceed current ASA and NEMA Specifications and its use shall be in accordance with the NEC.

Raceway size changes shall occur in and at boxes or cabinets only. All conduit, including short nipples, shall be sized for wire fill as per National Electric Code, 1978 Edition, no exceptions.

Minimum size rigid conduit for underground runs, in concrete floors, or under concrete slabs on grade shall be 3/4" diameter trade size.

All 90° bends on surface conduit and conduit over 1" trade size shall be shall be factory sweeps. All bends made on jobsite shall be long sweep, even radius, and shall not deform conduit or reduce interior diameter.

Conduit in contact with earth or fill shall be made up with water tight joints and (except when placed in gravel fill beneath slab) completely coated with coal tar enamel or asphalt paint.

DIVISION 16

Conduit and tubing between thermal differentials shall be sealed and graded to permit condensation to drain.

Raceway shall be supported on approved type of commercial brackets, stamped steel strap hangers, or pipe straps, at least one per each 8' of length and within 3' of each outlet box; secured to hollow masonry construction with toggle bolts, expansion bolts in concrete or brick, and wood screws on wood construction. Wooden plugs shall not be inserted in masonry. Nails shall not be used to fasten boxes or conduit. No studs, sharp screws or bolt heads shall project into any wire enclosures. Attachment wire and perforated strap will not be permitted.

Rooms and areas with finished effect (painted, paneled, tiles or otherwise decorated walls, ceilings) in new construction shall have boxes and cabinets flush mounted with the finished surface. All wiring shall be concealed where possible. Electrical Contractor shall take necessary precaution to keep raceway, boxes and cabinets free from foreign matter (dirt, water, plaster, concrete, etc.) Electrical Contractor shall cooperate with other Contractors to assure that conduit and boxes fastened to walls, floors and ceilings are plumb, level, securely fastened, and insure good appearance as well as proper functioning of all installations.

5.0 Conductors

Install a complete system of conductors. Unless shown otherwise, minimum wire size shall be No. 12 for 20 amp. circuits. All wire shall be copper, insulated for 600 volts. Low voltage control wiring may be 300 volt class if isolated under all conditions from line voltage.

6.0 Conductors

Wiring shall be as shown on the drawings and as required by the NEC.

Conductors installed within flexible conduit intended to allow physical travel or movement of the connected device and/or power source connection shall in addition to such other characteristics that the NEC may impose be stranded and suited to such use.

Conductors shall be inserted until interior of building has been physically protected from the weather and all mechanical work which is likely to injure the conductors has been completed.

Approved compounds may be used as a lubricant in inserting conductors in raceways. Conductor shall not be installed in any raceway when moisture exists within the conduit.

7.0 Boxes and Fittings

Boxes, condulets, and fittings used with steel conduit shall be galvanized or cadmium plated steel.

Unless otherwise stated elsewhere herein or on the plans, boxes shall be sized by the Contractor to fit the fixture, junction or device and to accommodate the size and number of conduits and conductors as required by NEC.

All boxes shall be rigidly supported and secured. Boxes in or on the ceiling intended for fixtures shall be secured to support four times the weight of the fixture. No devices or boxes shall be suspended by or be dependent on attachment wire, wood screws, or wood when the project is complete.

Connections of raceway to boxes shall be made with approved connectors only.

All box and cabinet connections shall be made using pre-formed knock-outs, punch cut, or drilled holes only. All openings, including re-stamped concentric knock-outs, shall be suitably reduced with commercial reducing washers where and if the locknut does not make substantial contact with the box throughout all 360 degrees. The use of torch or arc to burn holes shall not be allowed under any conditions.

The location of outlets and equipment shall be governed by structural conditions and obstructions. When necessary, relocate outlets so that when fixtures or other devices are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. In any case, the final location of outlets must be verified by the Engineer. Switches shall be mounted on strike side of doors as shown on plans, maximum 4" from door opening to first switch.

Where special equipment or devices are to be installed in outlet boxes, the Electrical Contractor shall obtain information from manufacturer of such equipment or devices to determine size of box required.

8.0 Junction and Pullboxes

Provide pullboxes or junction boxes in conduit runs where indicated or required. Size shall be as required by NEC for the number of conductors enclosed in the box. Removable covers shall be accessible at all times.

It shall be the responsibility of this Contractor to consult with the Mechanical Contractor before installing junction or pullboxes in order that any conflicts between the locations of conduit runs, piping and ductwork shall be avoided, and adequate working space in front of box covers shall be maintained. Boxes on concealed conduit shall be set with covers flush with finish wall or ceiling line.

9.0 Electrical Service System

9.1 General

The electrical contractor shall furnish and install all equipment and connections necessary for the 120/230 volt, 1 phase, 3 wire service as shown on the drawings and as described hereinafter.

The Electrical Contractor shall coordinate all requirements for a total electric service and metering with the power company. All work not provided by the power company shall be provided by the Contractor for a complete system. Coordinate service connection locations with power company.

The service connections shall be installed in strict accordance with the rules of the power company. The Electrical Contractor shall be responsible for all negotiations with the power company with regard to the service connections, and shall initiate the necessary requests to the power company for the work which shall be performed by the power company. This Contractor shall also pay all fees and charges submitted by the power company for their part of the service installation and connections. Provide metering as required by the power company.

10.0 Safety and Disconnect Switches and Fuses

10.1 Switches

Provide enclosed, fusible or non-fusible as applicable safety switches where indicated, required by NEC and herein specified. Safety switches shall bear the UL label and be furnished in NEMA-1 general purpose enclosure in dry locations, NEMA 3 raintight enclosures outdoors and wet locations. Switch shall be heavy duty horsepower rated, and shall have quick-make, quick-break mechanism. Switches shall be Westinghouse, G.E., Square D, I-T-E or F-PE-Heavy Duty or equal.

10.2 Fuses

Provide all fuses, unless otherwise stated or furnished integral with equipment, accurately rated and of the correct capacity to protect the circuits as shown and for the voltage specified. Fuses shall be Busman Low-Peak. Before ordering fuses for motor protection, coordinate exact sizing with equipment manufacturers, and provide fuse size as recommended by the manufacturer.

11.0 Branch Circuit Panelboards

Provide dead front, circuit breaker type load centers where indicated, complete with the number and size breakers as scheduled. Panels shall be listed by UL and so labeled. Cabinets shall be galvanized code gauge sheet steel providing wiring gutter space according to NEC. Fronts shall be of code gauge sheet steel with gray finish over rust inhibitor and shall include door and directory.

Panels shall be Bryant, Square D or G.E. Provide neatly typed circuit directories in each panel.

12.0 Wiring Devices

Provide all wiring devices where indicated on the drawings. All devices shall be ivory in color. Equal devices as manufactured by Bryant, Sierra, Pass and Seymour, Hubbell, and Slater and General Electric will be accepted for bidding.

12.1 Receptacles

All receptacles shall be of the grounding type.

Receptacles shall be as shown on the drawing or as follows (or equal):

1. 15A 125 V duplex - Bryant 5242-I (on 15A circuits).
2. 20A 125 V duplex - Bryant 5342-I (on 20A circuits).
3. Weatherproof Cover - Bryant 4550
4. GFI receptacle - P & S 1591 Fi
5. Special Purpose. Provide flush box with cover and wire directly to equipment switch or control.

12.2 Switches

General Light Switches shall be single pole, 20A 125V - Bryant 1121-I (or equal) or as shown on the drawings.

12.3. Device Plates

Provide a device plate for each outlet to suit the device installed. Device plates shall thoroughly cover the wall opening around the device, and shall be plumb and level and shall be tight to the wall.

Label all remote switches.

16300 LIGHT FIXTURES

Provide all fixtures, complete with lamps, as shown and/or as specified herein, or equal as may be allowed in writing by the Engineer.

Contractor shall furnish and install all light fixtures, complete with lamps as indicated and scheduled on the plans, or equal as may be allowed in writing by the Engineer. All fixtures shall comply with Article 410 of the NEC.

All fluorescent fixtures shall have C.B.M. Certified by E.T.L. high power factor ballasts and shall be so labeled or stamped. Ballasts shall be Super Premium Grade Class P. All fluorescent ballasts shall be for operation on voltage scheduled, or as shown.

All fluorescent fixtures shall have factory installed in each ballast circuit In-Line type GMF cartridge fuses in HLP holders of proper rating to insure maximum protection without "false" failures.

DIVISION 16

Where fixtures are specified with Acrylic plastic lens or diffusers, material shall be 100% Virgin Acrylic. Other materials will not be acceptable, unless approved in writing by the Engineer.

All incandescent lamps shall be inside frosted, 120 volt, unless otherwise noted.

All fixtures shall be installed in accordance with the manufacturer's recommendations.

Fixtures shall be installed parallel and symmetrical with building lines, level, rigid and plumb, and shall displace any one or more entire tile where such is the ceiling type.

All light fixtures shall be secured to the building structure or ceiling structure independent of ceiling finish material, using bar hangers as available or supplied with the fixture, otherwise specified. Recessed fixtures shall be connected by flexible conduit and high temperature wire in accordance with the NEC.

Fixture suspensions shall be with the use of metal components only and under no condition will the weight of the fixture be sustained by attachment wire. Supports to have safety factor of 6.

Contractor shall provide and install all framing, suspension accessories, hangers, fixture hickies, studs, extensions, stems, mounting blocks, canopies, straps, nipples, end caps and such equipment needed for complete fixture installation.

All lamps shall be General Electric, Sylvania, Westinghouse or approved equal. All lamps to be manufactured in United States.

16400 ELECTRICAL EQUIPMENT

Where electrical switchgear, troughs, panelboards, etc., are indicated to be mounted on wall surfaces, this Contractor shall first install a 3/4" type A-D plywood panel of sufficient size for mounting all equipment. Plywood panels shall be cleanly cut, without burrs or splinters, square, and painted two coats of gray enamel on both sides.

Plywood shall be anchored to walls by means of bolts. Equipment shall be attached to plywood by means of wood screws.

16500 MOTOR CONNECTIONS AND WIRING

The Electrical Contractor shall extend all power circuits, make connections, furnish and install disconnects and motor starters, connect special controls and complete all wiring as shown on the plans.

Conduit to all motors shall be terminated as near as practical to motor connection, but shall be completed to the motor with Seal-tite flexible conduit for vibration isolation.

16600 MECHANICAL EQUIPMENT

Perform all control wiring in accordance with the plans and specifications, and the manufacturer's recommendations, and install under the direction of a representative of the Control Supplier. All wiring for control systems shall be color coded or identified by tags to facilitate checking. Provide formica labels on the disconnect switches and starters for all motors wired under this section according to the designation given to motors on the plans.

The Contractor shall provide each motor with a horsepower rated disconnect switch and thermal over load protection as required by NEC. Check and coordinate all thermal protective devices with the equipment they protect.

16700 CONTROLS AND INSTRUMENTATION

Provide all controls as shown on the plans. See also Division 1, Section 1.3.

HILLTOP DIAMOND RING RANCH

C011 08 00 00	EMPLOYEE'S HOME DUCTWORK
D011 07 00 00	OWNER'S HOME DUCTWORK
D011 06 00 00	MOBILE HOME DUCTWORK
C011 05 00 00	ELECTRICAL
D011 04 00 00	GRAIN DRYER
D011 03 00 00	PUMP ROOM
D011 02 00 00	PIPING
D011 01 00 00	LOWER DRAWING

RE/SPEC INC.	
P.O. BOX 123 HILLTOP, ID 83702	
TITLE: GEOTHERMAL DRAWING	
DATE: 2-28-79	BY: J. H. HAY
1) 113	01 50 00

NOTE: ALL PVC PIPING SHOULD BE SIZED FOR 150°F TEMPERATURE AND 50 PSI PRESSURE. ALL PIPE SHOULD BE PRESSURE TESTED PRIOR TO BURYAL. SOCKET WELD CONNECTIONS SHOULD BE USED AT ELBOWS, T'S ETC, WITH BELL AND SOCKET CONNECTIONS USED ELSEWHERE TO COMPENSATE FOR THERMAL EXPANSION. CONCRETE THRUST BLOCKS SHOULD BE USED AT CORNERS. CLEANOUTS TO BE LOCATED IN VICINITY SHOWN, SUCH THAT FLUSHING PIPES THROUGH 1 INCH DRAIN WILL NOT CAUSE PONDING AND DRAINAGE WILL BE CARRIED AWAY EASILY. PIPING TO BE BURIED NOT COVERED IN DWG D011 02 12 00. NOTE 15

HILLTOP DIAMOND RING RANCH

- PIPING SYMBOLS-
- REDUCER
 - DIRECTION OF WATER FLOW
 - TEE
 - 90° ELBOW
 - 45° ELBOW
 - SIGNIFIES SOLVENT WELD
 - SIGNIFIES SCREWED CONNECTION
 - AIR PURGER
 - CIRCUIT SETTER OR PINCH VALVE OR SOLENOID VALVE
 - FLEXIBLE COUPLING
 - PRESSURE REDUCING VALVE OR RELIEF VALVE
 - TRIPLE DUTY VALVE
 - UNION

13	1	D011 02 11 00	TEE FOR OWNERS GARAGE
12	1	D011 02 12 00	TRENCHING (PIPE LINES)
11	2	D011 02 11 00	DISCHARGE POINTS
8	1	D011 02 08 00	OWNER'S HOME PIP.
7	1	D011 02 07 00	EMPLOYEE'S HOME PIP.
6	1	D011 02 06 00	SHOP PIPING
5	2	D011 02 05 00	MOBILE HOME PIPING
4	1	D011 02 04 00	HOSPITAL BARN PIPING
3	1	D011 02 03 00	GRAIN DRYER PIPING
2	2	D011 02 02 00	CLEANOUT
1	1	D011 02 01 00	WELL HEAD

RE/SPEC INC.	100'
DATE: 5-1-79	SCALE: 1"=100'
BY: 011	02
00	00
A	1

NOTE: ALL PIPE 6" SCH 80
STEEL ON SURFACE CONNECTING
TO BURIED 6" PVC
SECURE AIR PURGER AND
STAND PIPE TO TREATED POLE
TREATED POLE A MINIMUM
OF 6 FEET IN GROUND
THE CHECK VALVE & STAND PIPE
TO BE INSULATED
CAPPING VALVE MAY BE LEFT ON

WELL HEAD PLAN VIEW

7	1	FLEX COUPLING	A 031-02-01-06
6	1	1" PINCH VALVE	A 031-02-01-05
5	1	21/2" MIN. 4" TOP	TREATED POLE
4	1	CHECK VALVE	A 031-02-01-04
3	1	AIR PURGER	A 031-02-01-03
2	1	3" PINCH VALVE	A 031-02-01-02
1	1	1" P.W.M. 1/2" WY	A 031-02-01-01

PRICE _____ QUANTITY _____ DISCOUNT _____

RE/SPEC INC.
P.O. BOX 7731 HUNTSVILLE, AL 35896 (205) 544-7888

TITLE		WILLIAD		SCALE		1" = 1'-0"	
DESIGNED BY		DATE		CHECKED BY		DATE	
DRAWN BY		DATE		APPROVED BY		DATE	
CUT BY		DATE		CUT BY		DATE	

1) 1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12" 13" 14" 15" 16" 17" 18" 19" 20" 21" 22" 23" 24" 25" 26" 27" 28" 29" 30" 31" 32" 33" 34" 35" 36" 37" 38" 39" 40" 41" 42" 43" 44" 45" 46" 47" 48" 49" 50" 51" 52" 53" 54" 55" 56" 57" 58" 59" 60" 61" 62" 63" 64" 65" 66" 67" 68" 69" 70" 71" 72" 73" 74" 75" 76" 77" 78" 79" 80" 81" 82" 83" 84" 85" 86" 87" 88" 89" 90" 91" 92" 93" 94" 95" 96" 97" 98" 99" 100"

NOTE: 1/2" PERMASTRAND SHALL BE USED
AFTER GRAIN DRYER

1	1	1	1	1	1	1	1	1	1
A. C. C. OR OTHER 3" PINCH VALVE									
RE/SPEC INC.									
P. O. BOX 725 BAYVIEW, MI 48064									
TITLE: CILIAN (M)									
NOTED									
DATE: 6-23-73									
BY: MMK									
CHECKED: MMK									
APPROVED: MMK									
1) 0.11 0.2 0.2 0.6 A 1

5 OF 30

10	1	A 000-000-000-000	SPRINK VALVE
9	1	A 000-000-000-000	AIR VENT
8	1	A 000-000-000-000	RAIN PLUGGER
7	1	A 000-000-000-000	THERMAL EXPANSION TANK
6	1	A 000-000-000-000	GRAIN DRIVER PUMP
5	1	A 000-000-000-000	FLAIL VALVE ESTIMATOR
4	1	A 000-000-000-000	GATE VALVE
3	1	A 000-000-000-000	CONDUIT SPLITTER (8 1/2)
2	1	A 000-000-000-000	GRAIN DRIVER COIL

R/SPEC INC. P.O. BOX 100, 1000 GUY, ST. JOHN, GUYANA		DATE	BY
TITLE: GRAIN DRIVER PIPING		DATE	BY
REV	NO	DATE	BY
D	003	00	00
		A	101

REVISION	DATE	BY	DESCRIPTION
1	1/1/78	WJH	ISSUED FOR CONSTRUCTION
2	1/1/78	WJH	REVISION ORDER

TOP VIEW
SCALE: 1/4" = 1'-0"

NOTE: SECURE ALL PIPE AND
HEAT EXCHANGERS

5	4	A	15-42-08-10	AIR VENT
3	4	A033 02 04 03		CIRCUIT SETTER C-10
2	1	A033 02 04 02		HORIZONTAL COIL
1	3	A033 02 04 01		VERTICAL COIL

RE/SPEC INC.			
P. O. BOX 725 BIRD CREEK, MO 63006			
TITLE		DATE	
INDUSTRIAL HEAT PIPING		NOTED	
DRAWN BY		CHECKED BY	
DATE		DATE	
11	033	02	04 00 A

10 OF 10

REVISION	BY	DATE	DESCRIPTION
1	APR 87		ISSUED FOR CONSTRUCTION
2	APR 87		ISSUED FOR CONSTRUCTION

7 OF 30

4	1	ADD 1/2" = 1'	AIR VENT
5	1	ADD 1/2" = 1'	CIRCUL SETTER (100)
6	1	ADD 1/2" = 1'	1/2" = 1'
7	1	ADD 1/2" = 1'	1/2" = 1'
8	1	ADD 1/2" = 1'	1/2" = 1'
9	1	ADD 1/2" = 1'	1/2" = 1'
10	1	ADD 1/2" = 1'	1/2" = 1'
11	1	ADD 1/2" = 1'	1/2" = 1'
12	1	ADD 1/2" = 1'	1/2" = 1'
13	1	ADD 1/2" = 1'	1/2" = 1'
14	1	ADD 1/2" = 1'	1/2" = 1'
15	1	ADD 1/2" = 1'	1/2" = 1'
16	1	ADD 1/2" = 1'	1/2" = 1'
17	1	ADD 1/2" = 1'	1/2" = 1'
18	1	ADD 1/2" = 1'	1/2" = 1'
19	1	ADD 1/2" = 1'	1/2" = 1'
20	1	ADD 1/2" = 1'	1/2" = 1'
21	1	ADD 1/2" = 1'	1/2" = 1'
22	1	ADD 1/2" = 1'	1/2" = 1'
23	1	ADD 1/2" = 1'	1/2" = 1'
24	1	ADD 1/2" = 1'	1/2" = 1'
25	1	ADD 1/2" = 1'	1/2" = 1'
26	1	ADD 1/2" = 1'	1/2" = 1'
27	1	ADD 1/2" = 1'	1/2" = 1'
28	1	ADD 1/2" = 1'	1/2" = 1'
29	1	ADD 1/2" = 1'	1/2" = 1'
30	1	ADD 1/2" = 1'	1/2" = 1'

REVISION	DATE	BY	APP'D	REASON
1	02/07/04	RE/BPEC		ISSUED FOR CONSTRUCTION

NOTE: SECURE ALL PIPE

4	2	A033 02 07 04	1\"/>
---	---	---------------	-------

REVISION	DATE	BY	DESCRIPTION
1	02/07/04	AD	INITIALING
2	02/03/10	AD	FINISH ORDER

4	2	A011 02 07 04	1" FLEX COUPLE
3	1	A011 02 03 10	AIR VENT
2	1	A011 02 06 02	CIRCUIT SETTER
1	1	A011 04 08 01	CONTRACTOR'S WORKSHEET

RE/SPEC INC.			
P.O. BOX 100 NEW ORLEANS, LA 70110			
800-340-7800			
OWNER'S HOME RPTING			
DATE	BY	DATE	BY
02/07/04	AD	02/03/10	AD
10	01	01	01
1	1	1	1

REVISION	A	DESCRIPTION
DATE 7/26/77	REV	CHANGE ORDER

6\" TOP TREATED POSTS 7\" DIA.
BURIED 4\" DEEP, APPROX 14\"
APART C. TO C., 2 NEEDED

MATERIAL FOR PIPE HOLDERS TO BE OF
C\" TIMBER WOOD (MIN)
2 NEEDED

VIEW A

PICTORIAL VIEW

NOTE: HOLES IN POSTS FOR ANCHORS MUST BE 1\"/>

3\"/>

ROCKS TO PREVENT
EROSION
(BY SWNEK)

1	1	AN32 02 11 01	9\"/>
---	---	---------------	-------

DATE	1.1.73	BY	W. J. WILSON
DATE	1.1.73	BY	W. J. WILSON

NOTES

1. DESIGN POSITIONS SHOWN ARE FOR ESTIMATING PURPOSES ONLY. THE CONTRACTOR MAY REQUIRE LINES IF NECESSARY WITH THE PERMISSION OF RE/SPEC ENGINEERING.
2. THE MAIN 6" WELL HEAD SHOULD BE ON A CONCRETE PAD FROM THE WALL TO THE CHAIN DRIVE. AND LOW SPOTS ARE ALLOWED OUT TO SLOPING PRECIPITATION.
3. THE CHAIN FROM THE CHAIN DRIVE TO THE SHOP SHOULD ALSO CONTAIN NO LOW SPOTS.
4. THE WELL WATER DISCHARGE FROM THE SHOP TO DISCHARGE POINT NO. 1 SHOULD CONTAIN NO LOW SPOTS.
5. ALL BRACKS ON THE 6" LINE WILL BE CHECKED BY RE/SPEC PRIOR TO BURIAL.
6. EXCEPT FOR WELL WATER SUPPLY PIPES, ALL PIPES TO BE BELL & HOWELL PVC. SMALL LINES TO HOLD 40 PSI AT 150°F. (SEE NOTE 10)
7. ALL LINES TO BE PRESSURE TESTED PRIOR TO BURIAL.
8. ALL PIPE SHOULD BE BURIED IN A COMMON TRENCH WHERE FEASIBLE.
9. MINIMUM DEPTH OF COVER 4'
10. WELL WATER SUPPLY PIPES TO BE JOHNSHAWVILLE PERMA-STAND. FROM WELL HEAD TO PUMP HOUSE.
11. WHERE PRESSURE CAN RUN ABOUT PIPE COUPLERS ETC. CONCRETE THREAT BLOCKS SHALL BE INSTALLED.
12. PIPE SELECTION SHALL BE APPROVED BY RE/SPEC ENGINEERING.
13. TRENCHES SHALL NOT BE CLOSED UNTIL DEEPER BULGING SIGNALS ARE PLACED.
14. METAL RODS SHALL BE PLACED ON 100' O' CENTERS SUCH THAT A METAL DETECTOR CAN FIND THE PIPE LINE.
15. INSTALLATION SHALL BE SUCH THAT THERMAL EXPANSION AND CONTRACTION WILL BE COMPENSATED FOR BY THE PIPE JOINTS.

HILLTOP DIAMOND RING RANCH

DATE		1.1.73		BY		W. J. WILSON	
DATE		1.1.73		BY		W. J. WILSON	
<div style="display: flex; justify-content: space-between;"> <div> RE/SPEC INC. <small>P.O. BOX 125 APO FT. ST. 96340</small> </div> <div> PROJECT HILLTOP DIAMOND RING RANCH </div> </div>							
SCALE 1" = 100'				DATE 1.1.73			
BY W. J. WILSON				DATE 1.1.73			
NO. 11				REV. 17			
APP. A				DATE 1.1.73			

DESIGNED BY	DATE	BY	DATE	BY	DATE
REVISION	DATE	BY	DATE	BY	DATE
1	2/1/73	ASB			
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30

13 OF 30

RE/SPEC INC.		P.O. BOX 725		BAND CRY, SD 57105		605-241-7000	
<div style="display: flex; justify-content: space-between;"> <div> <p>111" FOR OWNER'S GARAGE</p> <p>222" (1)</p> <p>111" (1)</p> </div> <div> <p>111" (1)</p> <p>111" (1)</p> <p>111" (1)</p> </div> </div>							
11	111	11	11	11	11	11	11
11	111	11	11	11	11	11	11

NOTE: SECURE ALL PIPES
EXCHANGER TO BE FILLED
WITH WATER FROM SOURCE
APPROVED BY RE/SPEC

SECT C

SECT E

NOTE: TEMPERATURE GAUGE TO BE INSTALLED BY S.V.S.M.I.T.

SECT D

RE/SPEC INC.			
P.O. BOX 175 HAWAII CITY, HI 96706			
TELEPHONE (808) 255-1111			
FAX (808) 255-1111			
E-MAIL: RE/SPEC@AOL.COM			
PROJECT: 1111			
DATE: 6/23/77			
BY: [Signature]			
CHECKED BY: [Signature]			
APPROVED BY: [Signature]			
REVISIONS:			
NO.	DATE	BY	REASON
1	6/23/77		00 A

WALLING TO BE
CONCRETE WALL
3' MIN. THICK

SPACINGS VARY
AS SHOWN

REQ'D ONE PUMP STAND

PIPE PIT DETAILS

WELL WATER INLET, SOUTH SIDE

6 BAG MIX

WELL WATER DISCHARGE,
N. SIDE

ALL BAR #4

BAR "A"

BAR "B"

BAR "C"

BAR "D"

LOCATE HOLES DIRECTLY
ABOVE PIPE RUNS

REQ'D ONE PIPE SUPPORT
SUPPORT 10K LB SUPPLY PIPE
INTO HUB EXCHANGE

NOTE: BUILD FROM 40% OF MAX
FACED WITH MATERIAL
APPROVED BY RE/SPEC

DATE	REV	DESCRIPTION	BY	CHKD
11/1/77	1	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	2	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	3	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	4	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	5	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	6	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	7	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	8	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	9	RE/SPEC INC.	RE/SPEC	RE/SPEC
11/1/77	10	RE/SPEC INC.	RE/SPEC	RE/SPEC

- NOTE:
1. ALL AIR DUCTS TO BE MADE FROM 24 GAUGE GALVANIZED SHEET METAL.
 2. DIMENSIONS TO BE DETERMINED BY GRAIN DRYER SHED AND THE GRAIN DRYER.
 3. ALL 90° DUCT CORNERS TO HAVE DIRECTIONAL AIR VANES OR ROUNDED CORNERS, WHICH EVER IS CHEAPER.

RR/BPEC INC.		P.O. BOX 120		WINDY CREEK, MO 65758		620/240/1000	
TITLE: CHAIN DRYER DUCTWORK				NONE			
DATE: 1-15-78				DRAWN BY: RR			
CHECKED BY: RR				APPROVED BY: RR			
1	033	04	01	00	A	1	1

PROJECT NO.	DATE	REVISION
00000000	6.21.75	0000

①

ASPHALT SHINGLES OR
METAL ROOF

2" x 6" RATTERS
2' ON CENTER

ROOF PITCH
12"
4"

NOTE:
1. STANDARD OR POLE BARN FRAMING

6" THICK CONCRETE
FOUNDATION

SIDING

3'7"

4" CONCRETE

18 OF 30

1		11 075 04 03 00		GRAIN DRYER COIL SUPPORT	
R/S		RE/SPEC INC.		P.O. BOX 100 4000 OLY. RD. SEATTLE, WA 98108	
PROJECT: GRAIN DRYER SHED				SHEET: HALF	
DATE: 6.21.75				DRAWN BY: [blank]	
BY: [blank]				CHECKED BY: [blank]	
17	033	04	05	06	A 1-1

EXPLODED VIEW

- NOTE:
1. ALL WOOD USED SHALL BE OF ALL-WEATHER, PRESSURE TREATED WOOD.
 2. ALL NAILS AND FASTENERS SHALL BE GALVANNEED STEEL.

2		5" TREATED PLYWOOD	
1		TREATED 2" x 4"	
RE/SPEC INC.			
P.O. BOX 725, WARD CITY, MI 48091			
TITLE		SCALE 1" = 24"	
DESIGNED BY		CHECKED BY	
DATE 6-27-75		DATE	
REV	BY	DATE	REASON
D	033	04	00
A		1" 1

DATE	TIME	STATION NO.	COMMENTS
RE/SPEC INC. P O BOX 771 NORTH CRY, SD 57701	
TITLE PLUMB CONDITION		SCALE NONE	
DRAWN BY W.D. 79	CHECKED BY W	APPROVED BY W	
DATE 6-27-79	TIME 6:15 PM	DATE 6/27/79	TIME 6:15 PM
11 033	07	01	00
A			1

FURNACE CONTROL MODIFICATIONS - EMPLOYEE'S HOUSE, TRAILER HOUSES 1 & 2 (NO SCALE)

NOTES:

1. CHECK ALL MODIFICATIONS TO EXISTING FURNACE CONTROL WITH AUTHORIZED FACTORY SERVICE OR REPRESENTATIVE PERSONNEL
2. FIELD CONDITIONS MAY DIFFER FROM THOSE SHOWN (TYPICAL - ALL DRAWINGS)
3. D'STAT - HONEYWELL L601BA1000 - MOUNT BULB IN AIR DUCT, CONNECT SO CONTACTS BREAK ON TEMPERATURE RISE
4. RA, R2, R4, R5 - HONEYWELL RS22BA101A RELAY
5. T2, T4, T5 - HONEYWELL L400BA1015 REMOTE BULB CONTROLLER

HOSPITAL BARN & SHOP NOTES:

1. MINIMUM WIRE SIZE: #12/2 W/GROUND (GROUND ACCORDING TO NEC)
2. D (T'STAT) - HONEYWELL T451A1132 1/4"X7/8" SUBBASE - THERMOSTAT
3. S - 20A AC SWITCH - DRYWALL #901
4. R3 & R6 - GE KODOSJ102 1/2"X7/8" 600V COIL - MAGNETIC CONTACTOR
5. UH1 - TRANE 202PL, 1/2 HP, 115V, 1" UNIT HEATER (BY OTHERS)
6. UH2 - TRANE 60K2, 1/20 HP, 115V, 1" "
7. UH3 - TRANE 146P, 1/6 HP, 115V, 1" "
8. UH4 - TRANE 42K2, 1/20 HP, 115V, 1" "
9. T3 & T6 - HONEYWELL L400B A1015 REMOTE BULB CONTROLLER

GENERAL NOTES:

1. THERMOSTAT AND REMOTE BULB CONTROLLERS TEMP SETTINGS TO BE SPECIFIED BY OWNER'S ENGINEER (RE/SPEC INC.)
2. SEE DRWG D033 05 01 FOR T1-T8 MOUNTING DETAIL
3. ALL WORK TO BE DONE ACCORDING TO FEDERAL, STATE, & LOCAL CODES

RE/SPEC INC.		DATE 6/21/79	
P.O. BOX 125		RPO CITY, SD 57102	
TITLE CONTROL DIAGRAMS		SHEET 21 OF 50	
DESIGNED BY	CHECKED BY	DATE	BY
D 079	D 07	07	A

- WESTINGHOUSE HEAT PUMP CONTROL MODIFICATIONS - OWNER'S HOUSE (NO SCALE)**
- NOTES:
1. VERIFY & CHECK ALL MODIFICATIONS WITH FACTORY REPRESENTATIVE & AGAINST FIELD CONDITIONS
 2. R1 & R2 - HONEYWELL R8228A1014 RELAY
 3. D'STAT - HONEYWELL L6013A1000 MOUNT BULB IN RETURN AIR DUCT
 4. T1 - HONEYWELL LNO18A1015

PANEL A - GE TYPE NLAB 230V, 1P, 3W, 100AMP MAIN BREAKER, 20 CIRCUITS, SURFACE MOUNTED
BRANCH CIRCUIT BREAKERS - GE TYPE THQB OR EQUAL

- SHOP & PUMP HOUSE DISTRIBUTION CENTER (NO SCALE)**
- NOTES:
1. ALL ENCLOSURES TO BE NEMA 1
 2. GROUND CONNECTIONS TO BE ACCORDING TO NEC
 3. REMOVE EXISTING SHOP SERVICE - SURFEED SHOP PANEL FROM PANEL A
 4. PANEL A TO BE RATED AS SERVICE ENTRANCE EQUIPMENT
 5. VERIFY ALL EXISTING CONDITIONS
 6. P1 - GE TYPE CR206 W/10A
P2 - GE TYPE CR206 W/10A
P5 - GE TYPE CR206 W/ON-OFF } OR EQUAL

LOAD	BKR	CIR	100A MAIN BREAKER	CIR	BKR	LOAD
PUMP 1	20A	1		2	20A	PUMP 2
PUMP 1	20A	3		8	20A	PUMP 2
SHOP PANEL	70A	5		6	20A	PUMP 5
SHOP PANEL	70A	7		8	20A	PUMP 5
PUMP CONTROL CIRCUIT	20A	9		10	20A	PUMP HOUSE LIGHTS
PUMP CONTROL CIRCUIT	20A	11		12	20A	PUMP HOUSE RECEPTACLES
SHOP UNIT HEATERS	20A	13		14		
		15		16		
		17		18		
		19		20		

RE/SPEC INC.		REVISION	
1000 1000 1000 1000 1000 1000		1000 1000 1000 1000 1000 1000	
CONDITION (IN HAND)		NONE	
DATE: 10/10/00	BY: [Signature]	DATE: 10/10/00	BY: [Signature]
1) 1000	2) 1000	3) 1000	4) 1000

DATE	1-15-79	BY	KLH	REVISION	SEE DRAWING CHANGE ORDER
------	---------	----	-----	----------	--------------------------

NOTE: PUMP HOUSE LIGHTING SHALL BE 9, 40W-2 TUBE-FLUORESCENT STRIPS PROPERLY SIZED WITH SWITCHES AT EACH DOOR.

BY OWNER

NOTE: 1. THIS DRAWING IS DIAGRAMATIC ONLY. VERIFY ALL CONNECTIONS AND FIELD CONNECTIONS.

2. FLUORESCENT FIXTURES ARE TO BE BENJAMIN OR KEYSTONE 4'-2 TUBE OPEN STRIP W/2 F40CW LAMPS
3. \$3-THREE WAY-20A, 120V-277V AC SNAP SWITCH. MOUNT AT 42" ABOVE FLOOR
4. 0-20A-DUPLEX RECEPT. GROUNDING. MOUNT 42" ABOVE FLOOR.
5. MINIMUM WIRE SIZE - 12 THHN
6. CONDUIT MORE THAN 16" ABOVE FLOOR SHALL BE EMT. CONDUIT PLACED IN SLAB SHALL BE GALVANIZED RIGID PUMP & MOTOR CONNECTIONS TO BE LIQUIDTITE FLEX (MAINTAIN GROUND CONTINUITY)

BY OWNER

RE/SPEC INC. P.O. BOX 100 6000 W. 11TH ST. CHICAGO, ILL. 60628	
POWER DIAGRAM (DETAIL)	
DRAWN BY: KLH DATE: 5-28-79	CHECKED BY: KLH DATE: 6-12-79
DESIGNED BY: KLH DATE: 5-28-79	APPROVED BY: KLH DATE: 6-12-79
C 073 05 09 00 A -

REVIEWED BY	DATE	DESCRIPTION
CHANGED BY	DATE	DESCRIPTION
DATE	DATE	DESCRIPTION

NOTE

1. ALL BR LINES TO BE MADE FROM 24 GAUGE
ALUMINUM SHEET METAL.
2. LINE LENGTH TO BE DETERMINED BY THE
EXISTING POSITION OF THE VOR & MOVIE
SURFACE AND AIR FLOWS.
3. THE COIL AND ALL DUCTS TO BE COVERED
WITH 6" OF INSULATIONAL DUCTING THE FINAL
SECTION.
4. ALL 90° CORNERS TO HAVE DIRECTIONAL AIR
WAYS OR BRUSH CORNERS WHICH SUBS IS
WEATER.

[illegible]

REVISION NO.	1	DESCRIPTION
ISSUED BY	W. J. B.	ISSUED BY
DATE	6-20-71	DATE
		CHANGE ORDER

NOTE: MATL 1/8" GUAGE GALVANIZED
SHEET METAL
ONE REQUIRED

RE/SPEC INC.		P.O. BOX 725		MAYO CITY, MO 67050		800/343/7000	
HEAT EXCHANGER DUCT							
DATE OF ORDER 2-3-79				DATE OF DELIVERY 2-3-79			
C 011				06 01 03 A 1			

26 OF 30

REVISION NO.	1	DATE	10/1/77
DESIGN BY	W. J. H. H.	BY	W. J. H. H.
DATE C. 11/77	DATE	BY	W. J. H. H.

- NOTE:
1. CUT TO FIT FRAME.
 2. CUT TO FIT FRAME, MOREOVER AND AIR DUCTS.
 3. 1/2" THICK INSULATION SHALL BE OF ALL-WEATHER CHEMICAL TREATED WOOD.
 4. ALL NAILS AND FASTENINGS SHALL BE GALVANIZED STEEL.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

27 OF 30

LIMBAGE ROOM PLAN

FRONT ELEVATION

SECTION 1

SECTION 2

DATE		DRAWN BY		CHECKED BY	
RE/EPIC INC. 410 10th St. Suite 100, St. Louis, MO 63101					
PROJECT: CHASSIS ROOM DUCTWORK				SCALE: 1"=10'	
DRAWN BY: J. L. BROWN		CHECKED BY: J. L. BROWN		DATE: 5.5.24	
SHEET: 1		TOTAL SHEETS: 1		DATE: 5.5.24	
1) 0.53		0.7		0.0	
1.1		0.0		0.0

1	2	C033 08 01 00	ENLARGING DUCTS
DATE	TIME	PROJECT NO.	DESCRIPTION
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 5px;">R</div> <div> RE/SPEC INC. <small>P.O. BOX 1700 84000 DRY, UT 84000 801/343-1000</small> </div> </div>			
TITLE: EMPLOYEE'S HOME DUCTWORK			SCALE: NONE
DRAWN BY: <u>S. J. J.</u> DATE: <u>2-11-12</u>			CHECKED BY: <u>J. J.</u> DATE: <u>2/11/12</u>
REV	DATE	BY	REASON
C	01/1	08	00 00

PICTORIAL VIEW

1/8" FLANGE ALL AROUND TOP AND BOTTOM

THIS SURFACE TO MOUNT
TO TRANE MODEL PY 4 ROW
COIL. DRAWING A033 08 02 00

NOTE: MATL IS 24 GAUGE GALVANIZED
SHEET METAL
ONE REQUIRED

10 OF 30

RE/SPEC INC.		P.O. BOX 775		HARD CITY, MO 64708		609/343/7000										
<div style="display: flex; justify-content: space-between;"> <div> <p>ENLARGING DUCTS</p> <p>REVISED BY: S. J. P. 1</p> <p>DATE: 7-26-79</p> </div> <div> <p>REVISIONS</p> <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>BY</th> <th>REASON</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>013</td> <td>08</td> <td>01</td> <td>00</td> </tr> </tbody> </table> </div> </div>								NO.	DATE	BY	REASON	C	013	08	01	00
NO.	DATE	BY	REASON													
C	013	08	01	00												

ADDENDUM

FOR

GEOHERMAL DEMONSTRATION PROJECT
DIAMOND RING RANCH

'A' SIZED DRAWINGS
OF DETAIL INFORMATION

RE/SPEC Inc.
One Concourse Drive, P. O. Box 725
Rapid City, South Dakota

Grigsby
 D-100 Series
 Open Type Valve, Low Pressure
 6" Flange
 Buna-S "Armorite" Sleeve
 Operating Temp. 160°F
 Operating Pressure 5 psi

Mine and Smelter Corp.
 Box 16067
 Denver, CO 80216

Note: Equivalent
 Valve may be used
 with permission of
 RE/SPEC Engineering.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
		RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
TITLE 6" Pinch Valve			SCALE None			
DRAWN BY WHG		CHECKED BY		APPROVED BY TJZ		
DATE 3-14-79		DATE		DATE 4/19/79		
PAPER SIZE	JOB NO	ASSEMBLY NO	DRAWING NO	DETAIL NO	REVISION NO	PAGE
A	033	02	01	01	0	1 OF 35

Grigsby
 D-100 Series
 Open Type Valve, Low Pressure
 3" Flange
 Buna-S "Amorite" Sleeve
 Operating Temp. 160°F
 Operating Pressure 5 psi

Mine and Smelter Corp.
 Box 16067
 Denver, CO 80216

Note: Equivalent
 Valve may be used
 with permission of
 RE/SPEC Engineering.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868 </div> </div>						
TITLE 3" Pinch Valve					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-14-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	01	02	0	2 OF 35

6" Flanged Tangential Type Air Separator
 Model 495-S 6" Flanged Connector
 1½ Npt Vent Connection
 1¼ Npt Blowdown Connection
 124 psi Working Pressure
 Max operating temp. 375°F

Amtrol Inc.
 1400 Division Road
 W. Warwick, RI 02893

(401) 884-6300

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 20px;"> </div> <div> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE 6" Air Purger					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-14-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	01	03	0	3 OF 35

Swing Check Valve
 Polyvinyl Chloride Type 1 Grade 1
 Teflon Seat:
 0.5 psi back pressure seal (reverse flow)
 1½ Flanged

ASAHI/American
 425 Riverside Ave.
 Medford, MA 02155

(617) 391-2353

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868						
TITLE Check Valve					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-14-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	01	04	0	4 OF 35

Grigsby
D-100 Series
Open Type Valve, Low Pressure
1" Flange
Buna-S "Armorite" Sleeve
Operating Temp. 160°F
Operating Pressure 5 psi

Miner and Smelter Corp.
Box 16067
Denver, CO 80216

Note: Equivalent
Valve may be used
with permission of
RE/SPEC Engineering.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE 1" Pinch Valve					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-14-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	01	05	0	5 OF 35

3" Pipe Model PCS-300-FLG
 9" Overall Length
 5 3/4" Live Length
 300 psi Working Pressure

Flexonics Div.
 300 E. Devon Ave.
 Bartlett, IL 60103

(312) 625-1210

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="text-align: center;"> </div> <div style="margin-left: 20px;"> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE 6" Flex Couple						SCALE None
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-14-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	01	06	0	6 OF 35

**Bell & Gossett
Circuit Setter**

Furnished and install a calibrated bronze balance valve with provisions for connecting a portable differential pressure meter as shown on plans. Meter connections to have built-in check valves. An integral pointer shall register degree of valve opening. Each balance valve to be constructed with internal seals to prevent leakage around rotating element.

Each Balance valve shall be constructed for 125 lbs. working pressure at 250°F. and supplied with preformed polyurethane insulation suitable for use on heating and cooling systems.

Model No. CB 2½

Bell & Gossett
Fluid Handling Division
International Telephone & Telegraph Corp.
Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE Circuit Setter Valve (CB 2½)					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-19-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	03	01	0	7 OF 35

Trane
 Type W Coil
 30 in. Finned Width
 80 in. Finned Length
 4 Row

The Trane Company
 LaCrosse, WI 54601

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;"> </div> <div> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE Grain Dryer Coil					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-19-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	03	02	0	8 OF 35

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
TITLE Gate Valve						SCALE None
DRAWN BY GAB			CHECKED BY _____		APPROVED BY _____	
DATE 7-6-79			DATE _____		DATE _____	
PAPER SIZE	JOB NO	ASSEMBLY NO	DRAWING NO	DETAIL NO	REVISION NO	PAGE
A	033	02	03	03	0	9 OF 35

PLATE HEAT EXCHANGER

TYPE : P31-SA

DESIGN PRESSURE: 150 psi

TEST PRESSURE: 225 psi

DESIGN TEMP: 240 °F

NO. of PLATES: 58

APPROX. WEIGHT: 1350 LBS

HEATING SURFACE 119.8 Sq Ft.

American Heat Division
Alfa-Lava Thermal
P.O. Box 860
Somerville, N.J. 08876

****Note:** Purchased by S.D.S.M.&T.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868</div>						
TITLE Plate Heat Exchanger			SCALE None			
DRAWN BY GAB		CHECKED BY		APPROVED BY		
DATE 7-6-79		DATE		DATE		
PAPER SIZE	JOB NO	ASSEMBLY NO	DRAWING NO	DETAIL NO	REVISION NO	PAGE
A	033	02	03	07	0	10 ^{of} 35

Bell & Gossett
 Series 1513 Type B.
 1½ H.P. 155/230V 1Ø
 1750 rpm

6½" Impeller
 1½ AB NPT Discharge
 2 NPT Suction

Bell & Gossett
 Fluid Handling Division
 I.T.&T.
 Morton Grove, Ill. 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868				
TITLE Grain Dryer Pump						SCALE None
DRAWN BY GAB			CHECKED BY		APPROVED BY	
DATE 7-6-79			DATE		DATE	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	03	08	0	11 OF 35

Thermal Expansion Absorber
 Model No AST-12
 Max. Working Pressure = 125 psig
 12" Dia, 12½" Height

Amtrol Inc.
 1400 Division Road
 West Warwick, R.I. 02893

ph (401) 884-6300

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 6C5/343/7868 </div> </div>						
TITLE Thermal Expansion Tank					SCALE None	
DRAWN BY GAB			CHECKED BY		APPROVED BY	
DATE 7-6-79			DATE		DATE	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	03	09	0	12 ^{OF} 35

No. 87 Automatic Air Vent
 3/4 NPT External Thread
 1/2 NPT Internal Thread
 4 3/4 in. Tall
 150 psig Working Pressure
 240°F Maximum Operating Temp.

Bell & Gossett
 Fluid Handling Division
 I.T.&T.
 8200 N Austin Avenue
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
TITLE			Air Vent		SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY	
DATE 3-19-79			DATE		DATE	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	03	10	0	13 OF 35

Air Purger
 3" Pipe
 Model 448
 3/4" NPT Vent
 1/2" NPT Drain

Amtrol Inc.
 1400 Division Road
 W. Warwick, RI 02893

 ph (401) 884-6300

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
		TITLE 3" Air Purger			SCALE None	
DRAWN BY GAB		CHECKED BY		APPROVED BY		
DATE 7-6-79		DATE		DATE		
PAPER SIZE	JOB NO.	ASSEMBLY NO	DRAWING NO	DETAIL NO	REVISION NO	PAGE
A	033	02	03	11	0	14 OF 35

Trane
 Propeller Unit Heater
 Model No. 146P
 Type Vertical
 CFM 2220
 EAT 65°F
 Capacity 39 MBH
 GPM 4.5

Trane
 Commercial Air Conditioning Division
 LaCrosse, WI 54601

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
<div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868 </div> </div>			
TITLE Hospital Barn Vertical Coil			SCALE None
DRAWN BY WHG		CHECKED BY	APPROVED BY TJZ
DATE 3-19-79		DATE	DATE 4/19/79
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO. DETAIL NO. REVISION NO.
A	033	02	04 01 0
			PAGE 15 OF 35

Trane
Commercial Air Conditioning Division
LaCrosse, WI 54601

ITEM		QUAN.	DRAWING NO.		DESCRIPTION	
<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> <h1>RE/SPEC INC.</h1> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE Hospital Barn Horizontal Coil					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-19-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	04	02	0	OF 16 35

Bell & Gossett
Circuit Setter

Furnished and install a calibrated bronze balance valve with provisions for connecting a portable differential pressure meter as shown on plans. Meter connections to have built-in check valves. An integral pointer shall register degree of valve opening. Each balance valve to be constructed with internal seals to prevent leakage around rotating element.

Each Balance valve shall be constructed for 125 lbs. working pressure at 250°F. and supplied with preformed polyurethane insulation suitable for use on heating and cooling systems.

Model No. CB 1

Bell & Gossett
Fluid Handling Division
International Telephone & Telegraph Corp.
Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div> RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868</div>						
TITLE Circuit Setter Valve (CB 1)			SCALE None			
DRAWN BY WHG		CHECKED BY	APPROVED BY TJZ			
DATE 3-19-79		DATE	DATE 4/19/79			
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	04	03	0	17 OF 35

Trane
 Type P4 Coil
 12 in. Finned Width
 36 in. Finned Length
 4 Row

The Trane Company
 LaCrosse, WI 54601

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="margin-left: 10px;"> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868 </div> </div>						
TITLE Mobil Home Coil					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-19-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	05	01	0	18 OF 35

Trane
 Propeller Unit Heater
 Model No. 202 PL
 Type Vertical
 CFM 3390
 EAT 65°F
 Capacity 50 MBH
 GPM 7.4

Trane
 Commercial Air Conditioning Division
 LaCrosse, WI 54601

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="margin-left: 10px;"> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868 </div> </div>						
TITLE Shop Vertical Coil					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-19-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	06	01	0	19 OF 35

Trane
 Propeller Unit Heater
 Model No. 60W2
 Type Horizontal
 CFM 755
 EAT 65°F
 Capacity 20 MBH
 GPM 4.4

Trane
 Commercial Air Conditioning Division
 La Crosse, WI 54601

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin-right: 10px;"> <div style="font-size: 24px; font-weight: bold;">R</div> <div style="font-size: 24px; font-weight: bold;">S</div> </div> <div> <h2 style="margin: 0;">RE/SPEC INC.</h2> <p style="margin: 0;">P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>			
TITLE Shop Horizontal Coil			SCALE None
DRAWN BY WHG		CHECKED BY	APPROVED BY TJZ
DATE 3-19-79		DATE	DATE 4/19/79
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.
A	033	02	06
		DETAIL NO.	REVISION NO.
		02	0
			PAGE 20 OF 35

Trane
 Type P4 Coil
 18 in. Finned Width
 24 in. Finned Length
 4 Row

The Trane Company
 LaCrosse, WI 54601

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
<div style="display: flex; align-items: center;"> <div style="margin-left: 10px;"> RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868 </div> </div>			
TITLE Employee's Home Coil			SCALE None
DRAWN BY WHG		CHECKED BY	
DATE 3-19-79		DATE	
APPROVED BY TJZ		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.
A	033	02	07
DETAIL NO.	REVISION NO.	PAGE	
01	0	21 OF 35	

Flexible Connector
 1" Pipe
 Model PCS100MMT
 Working Pressure 534 psi
 Operating Temperature 250°F
 3" Live Length
 8" Overall Length

Flexonics Division
 300 E. Devon Ave.
 Bartlett, IL 60103

(312) 625-1210

Equivalent Couple
 may be used with
 the permission of
 RE/SPEC Engineering.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868				
		TITLE Employee's Home 1" Flex Couple			SCALE None	
DRAWN BY WHG		CHECKED BY		APPROVED BY TJZ		
DATE 3-20-79		DATE		DATE 4/19/79		
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	07	04	0	22 OF 35

The Trane Company
LaCrosse, WI 54601

ITEM		QUAN.		DRAWING NO.		DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868					
		TITLE		SCALE			
		Owner's Home Coil				None	
DRAWN BY WHG		CHECKED BY		APPROVED BY TJJ			
DATE 3-19-79		DATE		DATE 4/19/79			
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE	
A	033	02	08	01	0	OF 23 35	

Bell & Gossett
Circuit Setter

Furnished and install a calibrated bronze balance valve with provisions for connecting a portable differential pressure meter as shown on plans. Meter connections to have built-in check valves. An integral pointer shall register degree of valve opening. Each balance valve to be constructed with internal seals to prevent leakage around rotating element.

Each Balance valve shall be constructed for 125 lbs. working pressure at 250°F. and supplied with preformed polyurethane insulation suitable for use on heating and cooling systems.

Model No. CB 2

Bell & Gossett
Fluid Handling Division
International Telephone & Telegraph Corp.
Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868</div>						
TITLE Circuit Setter Valve (CB 2)			SCALE None			
DRAWN BY WHG		CHECKED BY	APPROVED BY TJZ			
DATE 3-19-79		DATE	DATE 4/19/79			
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	08	02	0	24 OF 35

Grigsby
 D-100 Series
 Open Type Valve, Low Pressure
 4" Flange
 Buna's "Armorite" Sleeve
 Operating Temp. 160°F.
 Operating Pressure 5 psi

Mine and Smelter Corp.
 Box 16067
 Denver, CO 80216

NOTE: Equipment
 valve may be used
 with permission of
 RE/SPEC Engineering.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> </div> <div> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE DISCHARGE POINTS 4" PINCH VALVE					SCALE NONE	
DRAWN BY _____			CHECKED BY _____		APPROVED BY _____	
DATE 6-28-79			DATE _____		DATE _____	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	02	11	01	0	25 OF 35

Bell & Gossett
 Series 1531 Type B
 1½" AB 1750 RPM
 7" Impeller
 1½ HP 115/230 v 1φ
 45 GPM @ 56' head

Bell & Gossett
 I T & T
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION																								
<div style="display: flex; align-items: center;"> <div> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>																											
TITLE Pump No. 1			SCALE None																								
DRAWN BY WIIG		CHECKED BY	APPROVED BY TJZ																								
DATE 3-20-79		DATE	DATE 4/19/79																								
PAPER SIZE	JOB NO.	ASSEMBLY NO.	<table border="1"> <tr> <td>DRAWING NO.</td> <td>DETAIL NO.</td> <td>REVISION NO.</td> <td>PAGE</td> </tr> <tr> <td>A</td> <td>033</td> <td>03</td> <td>00</td> </tr> <tr> <td></td> <td></td> <td></td> <td>01</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>26</td> </tr> <tr> <td></td> <td></td> <td></td> <td>35</td> </tr> </table>	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE	A	033	03	00				01				0				26				35
DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE																								
A	033	03	00																								
			01																								
			0																								
			26																								
			35																								

Bell & Gossett
 Series 1531 Type B
 1½" AB 1750 RPM
 7" Impeller
 1½HP 115/230 v 1φ
 45 GPM @ 56' head

Bell & Gossett
 I T & T
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
TITLE			SCALE			
Pump No. 2			None			
DRAWN BY WHG		CHECKED BY		APPROVED BY TJZ		
DATE 3-20-79		DATE		DATE 4/19/79		
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	02	0	27 OF 35

Dunham Bush
 Condensate Pump
 Model CHV-6 Single Pump
 10 gal. Receiver Capacity
 30 psi Capacity
 3/4 HP 115/230 v 1φ
 9 GPM Capacity

Dunham-Bush, Inc.
 Marshalltown, IA 50158

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868 </div> </div>						
TITLE Pump No. 5					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-20-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	05	0	28 OF 35

Flexible Connector
 3" Pipe
 Model PCS-300-FLG
 5 3/4" Live Length
 9" Overall Length

Flexonics Division
 300 E. Devon Ave.
 Barlett, IL 60103

(312) 625-1210

Equivalent Couple
 may be used with
 the permission of
 RE/SPEC Engineering.

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7668				
TITLE 3" FLG. Flex Couple						SCALE None
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-20-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	06	0	29 OF 35

Ex-Trol Expansion Tank
 AX Series (ASME)
 Model AX-200V
 Volume 110.7 gal.
 Accept Volume 34.5 gal.
 Height 65½"
 Diameter 24"
 System Taps 1" NPT
 Maximum Working Pressure 125 psi
 Maximum Operating Temperature 240°F

Amtrol Inc.
 1400 Division Road
 W. Warwick, RI 02893

 (401) 884-6300

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868 </div> </div>						
TITLE Expansion Tank						SCALE None
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-20-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	07	0	OF 30 35

Bell & Gossett
 ASME Relief Valve
 Number 750-50
 50 psi Setting
 1" NPT Inlet
 1½" NPT Discharge
 1,100,000 BTUH Capacity

Bell & Gossett
 I T & T
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPID CITY, SD 57709 605/343/7868				
TITLE Relief Valve			SCALE None			
DRAWN BY WHG		CHECKED BY		APPROVED BY TJZ		
DATE 3-20-79		DATE		DATE 4/19/79		
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	08	0	31 OF 35

Bell & Gossett
 Triple Duty Valve
 Model 3D-3
 Size 3"
 Inlet and Outlet 3" NPT Female

Bell & Gossett
 I T & T
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
TITLE			SCALE			
Triple Duty Valve			None			
DRAWN BY		CHECKED BY		APPROVED BY		
WHG				TJZ		
DATE		DATE		DATE		
3-20-79				4/19/79		
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	09	0	32 OF 35

Industrial Air Vent
 3/4 NPT Female Inlet
 1/2 NPT Female Outlet
 Cast Iron Body
 Maximum Working Pressure 150 psi
 Maximum Operating Temperature 240°F

Amtrol Inc.
 1400 Division Road
 W. Warwick, RI 02893

(401) 884-6300

ITEM	QUAN.	DRAWING NO.	DESCRIPTION
RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868				
		TITLE		SCALE		
		Air Vent		None		
DRAWN BY WHG		CHECKED BY		APPROVED BY TJZ		
DATE 3-20-79		DATE		DATE 4/19/79		
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	12	0	OF 33 35

Suction Diffuser
 Bell & Gossett
 Model DB
 System 3" Female Pipe Thread
 Pump 2" Female Pipe Thread
 Material
 Type: x
 Body: Cast Iron
 Inlet Vanes: Steel
 Orifice Cylinder: Steel
 Start Up Strainer: 16 Mesh Bronze

Bell & Gossett
 I T & T
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> RE/SPEC INC. P O BOX 725 RAPD CITY, SD 57709 605/343/7868 </div> </div>						
TITLE Suction Diffuser					SCALE None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-20-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	13	0	34 OF 35

Pressure Reducing Valve
 Bell & Gossett
 Model B7
 Size 3/4"
 Brass
 Pressure Set 12 psi
 Adjustable Range 8-25 psi

Bell & Gossett
 I T & T
 Morton Grove, IL 60053

ITEM	QUAN.	DRAWING NO.	DESCRIPTION			
<div style="display: flex; align-items: center;"> <div style="margin-left: 20px;"> <p>RE/SPEC INC.</p> <p>P O BOX 725 RAPD CITY, SD 57709 605/343/7868</p> </div> </div>						
TITLE					SCALE	
Pressure Reducing Valve					None	
DRAWN BY WHG			CHECKED BY		APPROVED BY TJZ	
DATE 3-20-79			DATE		DATE 4/19/79	
PAPER SIZE	JOB NO.	ASSEMBLY NO.	DRAWING NO.	DETAIL NO.	REVISION NO.	PAGE
A	033	03	00	15	0	35 OF 35