

National Radio Astronomy Observatory
Tucson, Arizona

February 24, 1988

MEMORANDUM

TO: D. Emerson
FROM: D. Ross *DER*
SUBJECT: VLBA-12 Meter Interconnection

Seven companies were requested to submit budgetary estimates for

(1) trenching and installing one 6 inch PVC schedule 40 conduit at a depth of 3 feet and bedded in sand 3 inches on each side, and

(2) the installation of 3' x 3' x 3' concrete pull boxes at a maximum distance of 300 feet or at a point where direction change exceeds 30°. Pull boxes are to be set in gravel for drainage.

Specifications and site plans were sent to the companies listed on page 2 with the exception of KPNO who declined early on due to lack of manpower. Four companies inspected the site and gave estimates. A brief summary of the estimates are shown on page 2. These are budgetary estimates. Should we decide to proceed with the project, we must solicit bids. I suggest we bid the project two ways: 1) cost per foot based on the amount of blasting required and 2) a fixed price.

These estimates do not include:

- 1) Cable cost
- 2) Labor cost to install cable
- 3) Entry into either building

Once cable specifications, i.e., loss, phase stability, etc., has been established I can give you a more accurate cost estimate of overall project.

The contractor will be required to pay the Davis-Bacon wage scale. I have not included copies of the wage scale in this memo. I have them if you are interested.

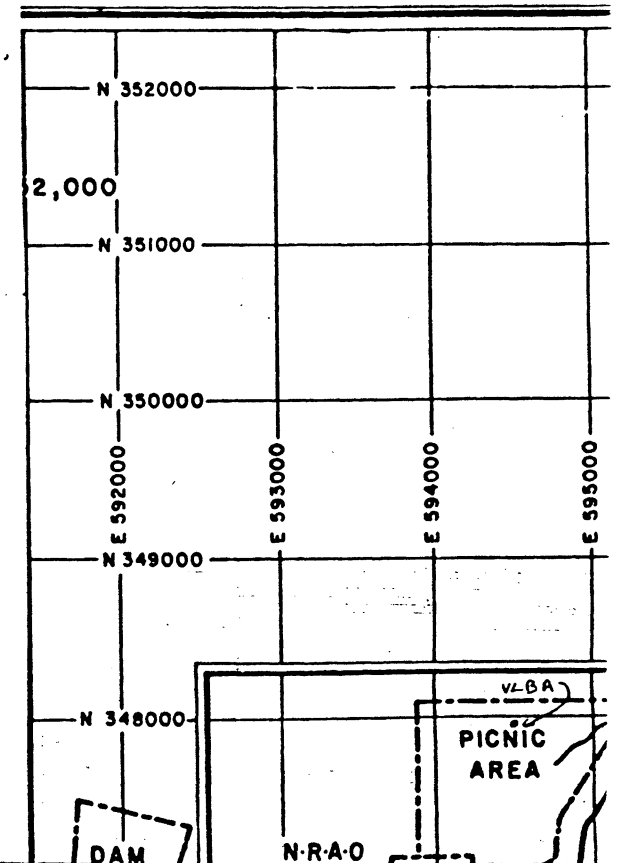
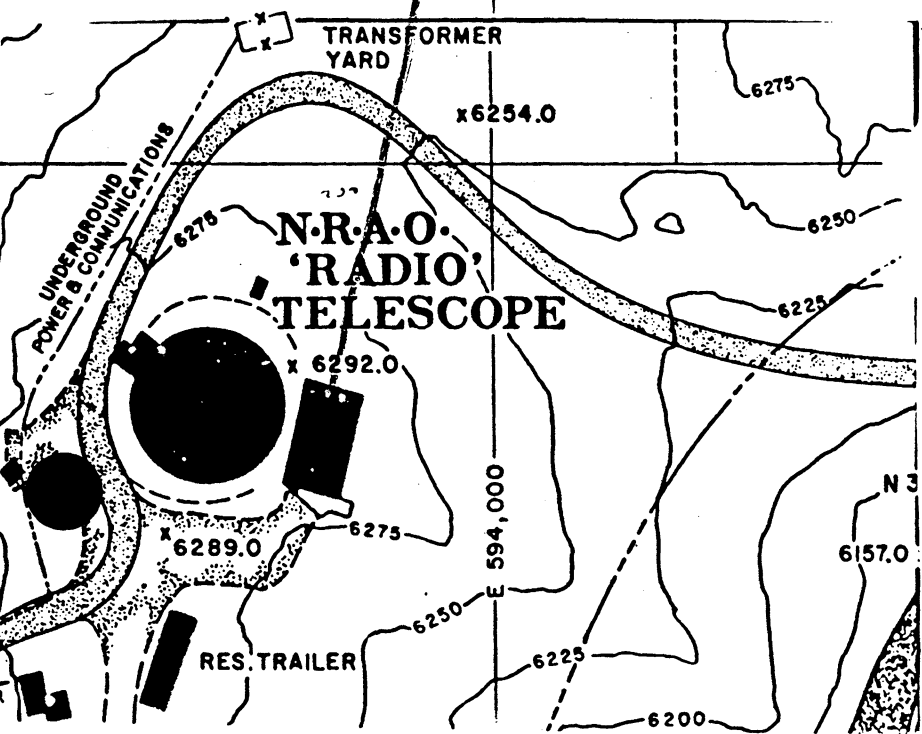
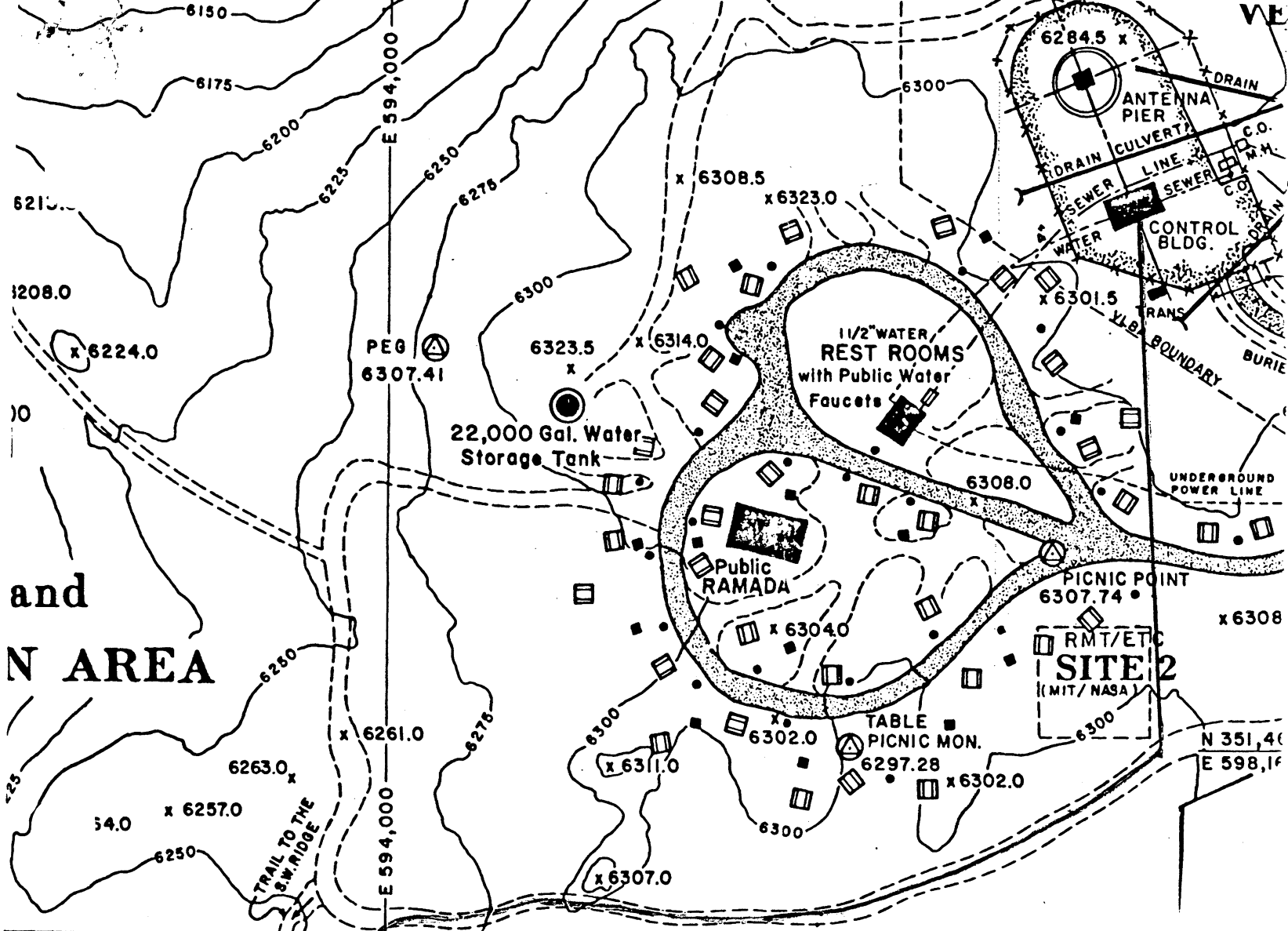
DR:mt

Attachments: Summary, Site Plan, Request, Estimates

c: P. Napier
P. Jewell

INSTALLATION OF CONDUIT BETWEEN VLBA & 12 METER

<p>Ages Company & Utility Contractor 3343 W. Sunset Rd. Tucson, AZ 85705</p>	<p>\$23,000 + 120/hr for blasting* + <u>blasting material</u> \$27,000</p>	<p>Cost/ft=\$15.73 + blasting Cost/ft=\$18/hr includes blasting</p>
<p>*Assume 240'/day and 800' blasting cost ~\$4000</p>		
<p>Luster Contracting, Inc. 1720 S. Mission Rd. Tucson, AZ 85713</p>	<p>\$42,650</p>	<p>Cost/ft = \$28.43</p>
<p>Hoke Construction Company 6505 W. Trails End Rd. Tucson, AZ 85745</p>	<p>\$18,000 to \$27,000</p>	<p>Cost/ft = \$12.00 to \$18.00</p>
<p>Tricon Contracting, Inc. 755 S. Houghton Rd. Tucson, AZ 85745</p>	<p>Not interested.</p>	
<p>PTUA P. O. Box 816 Sells, AZ 85634</p>	<p>No response.</p>	
<p>S M & R Sasabe Star Route Box 25-A Tucson, AZ 85736</p>	<p>\$26,000</p>	<p>Cost/ft = \$17.40</p>
<p>KPNO Sells Star Rt. Box 220 Tucson, AZ 85735</p>	<p>Manpower not available.</p>	





NATIONAL RADIO ASTRONOMY OBSERVATORY

949 NORTH CHERRY AVENUE CAMPUS BUILDING 65 TUCSON, ARIZONA 85721-0655
TELEPHONE 602 882-8250

December 23, 1987

¶Address¶

Attention: ¶Attention¶

Dear ¶Salutation¶:

The NRAO is presently seeking budgetary estimates for the installation of 1 ea. 6" conduit between the VLBA telescope and the 12 meter telescope.

The specifications are as follows:

1. 6" PVC schedule 40 buried 3 feet deep to bottom, bedded in sand with 3" on each side.
2. Concrete pull boxes 3'x 3' x 3' are to be installed at maximum distance of 300' or at a point where direction change exceeds 30°. Pull boxes are to be set in gravel for drainage.

I've attached a site plan showing the proposed routing.

Sincerely,

Dewey E. Ross

DER:mt

Attachment

To: Dewey Ross, NRAO

10-14-87

1/4

Sm#R 791-2890

Budget Estimate for installation of buried conduit from VLBA Control Bldg to 12M NRAO radio telescope at Kitt Peak

Assume conduit is 6" PVC sch. 40 buried 3' deep to bottom and 3'x3'x3' concrete pull boxes are to be installed every 300'. Total length of trench is 1500' (5 pull boxes required because of direction changes).

A. Excavation

Assume Case 580 backhoe will avg. 200' of trench / day in medium / hard decomposed granite and blasted rock.

580D backhoe 8 hrs x \$45/hr = \$360/day
 Mobilization cost: \$400 + 8 days on job = 50/day
 Total cost/day = \$410

Excavation cost / ft	= \$2.05
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B. Drilling & Blasting (18" wide ditch for 2 conduits)

Assume 1 man drills 240' of hole / day \Rightarrow 60 holes 4' deep. Blasting 18" wide ditch requires 2 rows of holes spaced @ 2' ctrs. \therefore 2 men will drill out 120' of ditch per 8 hrs.

185/day labor cost / day for 3 men (2 drillers + 1 powderman) = \$600/day
 compressor, drill steel, 2 jackhammers, hoses = 250/day
 50 day Explosives = 50/day
 \$235/day Transportation cost = 50/day
 ~1.00/ft. Total cost/day = \$950

Blasting cost / ft = \$950/120' = \$7.92

Assume 50% blasting for this project

Blasting cost / ft	\approx \$4.00
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C. Install 6" pvc conduit (Sch. 40)

$$\text{PVC pipe cost} = \$4.00/\text{ft}$$

$$\text{Delivery cost: } \$150/1500' = 0.10/\text{ft}$$

Installation cost:

1 man hand grading bottom of trench + 2 men laying pipes

@ 1jt / 15min. \Rightarrow say 6 days / 1500'

$$\text{Labor cost: } 240/\text{day}/\text{man} \times 2 \text{ men} \times 6 \text{ days} = 2880$$

$$+ 200/\text{day} \times 1 \text{ man} \times 6 \text{ days} = 1200$$

$$= \$4080$$

$$\text{transp. cost } \$50/\text{day} \times 6 = 300$$

$$= \$4380$$

$$= \$4380/1500'$$

$$\text{Labor cost} = 2.92/\text{ft}$$

$$\text{Pipe cement + primer (if req'd)} 6 \text{ gal} \times \$25/\text{gal} \Rightarrow 0.10/\text{ft}$$

$$\boxed{\text{Pipe installation cost / ft} = 7.12/\text{ft}}$$

Note: J. Stark estimate is (1 conduit) $\$12.44/\text{ft}$
(2nd conduit) 12.00

D. Install 5 pull boxes (3'x3'x3' concrete pre-cast) including French drain (gravel) underneath

$$5 \text{ precast boxes @ } \$660/\text{ea} \times 1.20 = \$3960$$

$$6 \text{ cu yd gravel for drains} \times \$20/\text{c.y. (delivered)} = 120$$

$$15 \text{ sks gravel} \times \$7.00 = 105$$

$$\text{backhore } 1 \text{ hr}/\text{box} \times 5 \text{ boxes} \times 45/\text{hr} = 225$$

$$\text{labor to set boxes + gravel } 5 \text{ man days} \times 200/\text{day} = 1000$$

$$\text{transp. cost } 50/\text{day} \times 5 \text{ days} = 250$$

$$= \$5660$$

$$\boxed{\text{Cost / pull box} = \$1132}$$

E. Backfilling conduit trenches

1. sand for bedding around conduit

$$1 \text{ ft}^2 \times 1500' \div 27 \Rightarrow 56 \text{ cu yd}$$

sand cost from borrow pit @ bottom of mtn:

$$\begin{aligned} & \$12/\text{cu. yd. (loaded + hauled to site)} \times 60 \text{ cu yd} \times 1.20 \text{ (waste factor)} \\ & = \$864 \end{aligned}$$

2. labor to sand-in conduit

$$3 \text{ men} \times 5 \text{ days} \times \$200/\text{man/day} = \$3000$$

3. compactor 5 days \times \$50/day = 2504. loader to trim sand 40 hrs \times \$45/hr = 1800

5. restore area to normal = 86

$$\underline{\$6000}$$

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Backfilling cost / ft	=	\$2.00
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Recap:

1. For single conduit:

A. Excavation		\$2.05/ft	
B. Blasting	2.00/ft + 25% extra contingency	2.50	(J.S.)
C. PVC conduit		7.12	12.44*
D. Backfill		2.00	
D. Pull Boxes	5660/1500 = 3.73/ft	\$13.67/ft	\$18.99
		3.73	
		<u>17.40/ft</u>	

2. For two conduits side by side:

A. Excavation	2.05/ft + 25% contingency	= \$2.60/ft	
B. Blasting		= 4.00	(J.S.)
C. PVC conduit	7.12 x 2	= 14.24	24.44*
D. Backfill		= 4.00	
		\$24.84/ft	\$35.04

Recap, cont'd

3. For two conduits one on top of the other:

I would not recommend this because labor costs for conduit installation would be much higher than excavation savings

4. Cable Pull boxes

5 ea @ \$1132 = \$5660

Note:

This estimate is intended for budget purposes only

Sicrity Mining & Ranching Co.

John T. Harris

P.S. This estimate does not include pull rope, watering (if required) and is based on the route along the fire break road.

AGES CONTRACTING, INC.
3343 WEST SUNSET ROAD
TUCSON, ARIZONA 85706
(602)293-2835

February 12, 1988

National Radio Astronomy Observatory
949 North Cherry Avenue
Campus Building 65
Tucson, Arizona 85721-0655

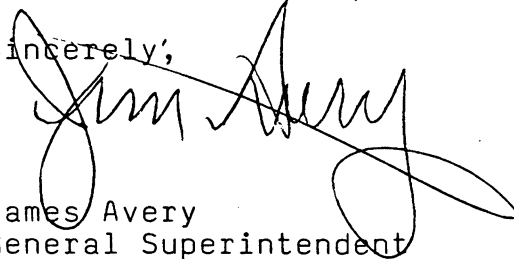
Attention: Dewey Ross

Here is a budgetary proposal for placing approximately 1,500 feet of 6" shd. PVC and up to 6 handholes set in gravel. All trench will be compacted back to original 95%. Street cuts will be paved back to original condition. Any additional pipe or work inside either building will be negotiated at that time.

Labor & Equipment	\$12,429.75
Materials	<u>\$11,172.50</u>
Combined	\$23,602.25

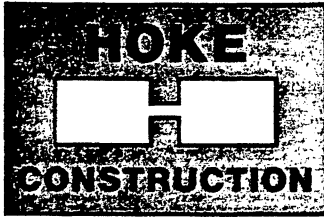
Any areas that might need blasting would be done by Southwest Blasting at \$120.00 per hour plus explosives. This over and above the combined price listed above.

Sincerely,



James Avery
General Superintendent

JA:js



Rough Terrain Specialists

6505 West Trail's End Road
Tucson, Arizona 85745
(602) 743-7575 Mobile 882-1076

January 27, 1988

National Radio Astronomy Observatory
949 North Cherry Avenue
Campus Building 65
Tucson, Arizona 85721-0655

ATTN: Dewey Ross

RE: Installation of 6" Conduit

Dear Mr. Ross:

Sorry that I have taken so long in getting this estimate for you.

It appears that excavation would be relatively easy for 800 or 900 L.F. at about \$1.50 to \$2.00 per foot; However, approximately 400 or 500 L.F. may be rock which would require either blasting or jackhammering raising the cost to about \$10.00 to \$12.00 per foot for those areas. Thus, I would guess excavation to be about \$6,000.00 to \$8,000.00.

Concrete pull boxes cost approximately \$750.00 to \$900.00 delivered depending on type of lids, etc.. It appears that the job would probably require at least 5 boxes at \$4,500.00.

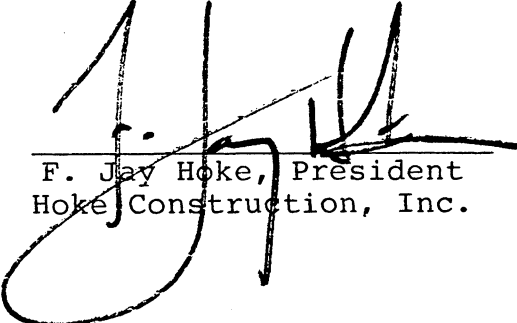
6" schedule 40 PVC conduit is a special order item which runs \$4.10 per foot plus extra fittings and delivery. This cost would be about \$6,000.00. 4" PVC is more commonly used and available at \$1.61 per foot. This would be \$2,300.00 delivered.

If bedding material is imported to the site an approximate cost would be \$1,000.00 to \$2,000.00. Although it appears that some of the existing spoil could be screened and utilized for bedding.

Labor and equipment for installation and backfilling would run \$4,000.00 to \$6,000.00.

The cost for this project depends on the final specifications and would probably be between \$18,000.00 and \$27,000.00 with the actual cost probably being around \$24,000.00 or \$25,000.00.

I hope this is of assistance to you. Feel free to call on me if you need further assistance.


F. Jay Hoke, President
Hoke Construction, Inc.

FJH/dfn
cc

DESIGN • EXCAVATION • CONSTRUCTION

Proposal

Page No. _____ of _____ Pages

USTER CONTRACTING INC.
.720 S. MISSION ROAD
TUCSON, ARIZONA 85713
LIC. NO. 50688

Mr. Dewey E. Ross

PROPOSAL SUBMITTED TO

PHONE

DATE

National Radio Astronomy Observatory

2-18-88

STREET

JOB NAME

949 North Cherry Avenue, Campus Building 65

CITY, STATE AND ZIP CODE

JOB LOCATION

Tucson, Arizona 85721-0655

ARCHITECT

DATE OF PLANS

JOB PHONE

We hereby submit specifications and estimates for:

To place 6" P.V.C. schedule 40 buried 3 ft. deep, with 3" of sand on each side between the ULBA telescope and the 12 Meter telescope.

To place pull boxes set on gravel for drainage.

We Propose hereby to furnish material and labor — complete in accordance with above specifications, for the sum of:

Forty-Two Thousand Six Hundred Fifty Dollars and no/100 _____ dollars (\$ 42,650.00)

Payment to be made as follows:

All material is guaranteed to be as specified. All work to be completed in a workmanlike manner according to standard practices. Any alteration or deviation from above specifications involving extra costs will be executed only upon written orders and will become an extra charge over and above the estimate. All agreements contingent upon strikes, accidents or delays beyond our control. Owner to carry fire, tornado and other necessary insurance. Our workers are fully covered by Workmen's Compensation insurance.

Authorized Signature

Albert J. Juarez

Note: This proposal may be withdrawn by us if not accepted within 60 days.

Acceptance of Proposal — The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.

Date of Acceptance: _____

Signature _____

Signature _____