



U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON 25

May 15, 1947

ADDRESS REPLY  
TO  
BUREAU

REFER TO FILE  
M-3 & XIV-5

Mr. Grote Reber  
212 W. Seminary Avenue  
Wheaton, Illinois

Subject: CST-8344

Sirs:

Enclosed are three (3) copies of our contract CST #8344 covering Cosmic Noise Measuring Apparatus. Please execute all copies and return promptly.

It is noted that the acceptance date of 15 days is about to expire. It would be appreciated if you would extend this date to at least June 15 to allow us sufficient time to take the necessary steps required before we can issue our formal order.

Very truly yours,

A handwritten signature in cursive script, appearing to read "C. B. Kipps".

C. B. Kipps, Chief  
Procurement Section

STANDARD GOVERNMENT FORM OF BID

4-24-47  
mlh:XIV-5

(SUPPLY CONTRACT)

ORIGINAL  
DUPLICATE } Indicate which  
TRIPPLICATE } by erasure

Opening Date for this Bid

2 P.M., M., May 3, 1947

To Director

PLACE Wheaton, Illinois

National Bureau of Standards

DATE May 1st, 1947

In compliance with your invitation for bids to furnish materials and supplies listed on the reverse hereof or on the accompanying schedules, numbered: X-1663

the undersigned,

a corporation organized and existing under the laws of the State of  
a partnership consisting of

an individual trading as designer and builder

of the city of Wheaton, Illinois

hereby proposes to furnish, within the time specified, the materials and supplies at the prices stated opposite the respective items listed on the schedules and agrees upon receipt of written notice of the

acceptance of this bid within 15 days (60 days if no shorter period be specified) after the date of opening of the bids, to execute, if required, the Standard Government Form of Contract (Standard Form No. 32) in accordance with the bid as accepted, and to give bond, if required, with good and sufficient surety or sureties, for the faithful performance of the contract, within 10 days after the prescribed forms are presented for signature.

Discount will be allowed for prompt payment as follows: 10 calendar days none percent; 20 calendar days percent; 30 calendar days percent; or as stated in the schedules.

(Time will be computed from date of the delivery of the supplies to carrier when final inspection and acceptance are at point of origin, or from date of delivery at destination or port of embarkation when final inspection and acceptance are at those points; or from date correct bill or voucher properly certified by the contractor is received if the latter date is later than the date of delivery.)

*Best Railys*  
(Witness to signature)

*Grote Reber*  
(Full name of bidder)

212 W. Seminary Ave.

Wheaton, Illinois

(Address)

NOTE.—See Standard Government Instructions to Bidders and copy of the Standard Government Form of Contract, Bid Bond, and Performance Bond, which may be obtained upon application.

To insure prompt payment bills should be certified as follows: "I certify that the above bill is correct and just and that payment therefor has not been received."

*Turned 3 copies into Kippe on 5-7-47*

**SCHEDULE**

ITEM No.	ARTICLES OR SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT	
					Dollars	Cents
	<p>Cosmic Noise Measuring Apparatus</p> <p>To be in accordance with attached specifications.</p> <p>If you are unable to furnish same as indicated above, alternate bids will be considered. If alternate bid is given bidder must furnish complete descriptive literature.</p> <p>F.O.B. NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.</p> <p>BID BOND: will be required in the amount of \$250.00.</p> <p>PERFORMANCE BOND: will be required in the amount of 50% of the contract price.</p> <p>The Scientific Industrial and Laboratory Instruments Industry Minimum Wage Determinations of the Secretary of Labor are applicable to this contract.</p> <p><u>AGGREGATE BID</u></p> <p>No bid will be considered if delivery date exceeds 120 days from date of order.</p> <p>The attached Sheets "P-2", "P-8", and "S-19" form a part of this contract.</p> <p>Delivery Date:</p> <p>On or before 1st Sept. 1947</p> <p>318 W. Belmont Ave.</p>					
						<p><b>TOTAL \$18,570.00</b></p>

(Continued on \_\_\_\_\_ sheets of Standard Form 36, attached hereto, each of which should bear the name of the bidder)  
 Note.—Insert in this schedule conditions of delivery.

## INSTRUCTIONS TO BIDDERS

### (CONSTRUCTION AND SUPPLIES)

1. **Preparation of bids.**—Unless otherwise directed in the invitation, bids shall be submitted in triplicate. Forms furnished, or copies thereof, shall be used, and strict compliance with the requirements of the invitation, these instructions, and the instructions printed on the forms is necessary. Special care should be exercised in the preparation of bids. Bidders must make their own estimates of the facilities and difficulties attending the performance of the proposed contract, including local conditions, uncertainty of weather, and all other contingencies. All designations and prices shall be fully and clearly set forth. Copies of the bids shall be identical. The proper blank spaces in the bid and guaranty forms shall be suitably filled in.

2. **Labor and material not to be furnished by the Government.**—The Government will not furnish any labor, material, or supplies unless specifically provided for in the contract.

3. **Signature to bids.**—Each bid must give the full business address of the bidder and be signed by him with his usual signature. Bids by partnerships must furnish the full names of all partners and must be signed with the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the State of incorporation and by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. The name of each person signing shall also be typed or printed below the signature. A bid by a person who affixes to his signature the word "president," "secretary," "agent," or other designation, without disclosing his principal, may be held to be the bid of the individual signing. When requested by the Government, satisfactory evidence of the authority of the officer signing in behalf of the corporation shall be furnished.

4. **Bids for all or part.**—Where bids are not qualified by specific limitations, the Government reserves the right of awarding all or any of the items according to its best interests. Unless otherwise required in the specifications, bids for supplies shall be submitted in accordance with the numbered item or items given in the schedule.

5. **Alternative bids.**—Alternative bids will not be considered unless called for.

6. **Specifications and schedules.**—The specifications, conditions, schedules, and drawings which form the basis of any bid will be considered as a part thereof and will form a part of the contract. Copies of these papers, together with a copy of the standard contract form, including authorized additions or deletions, if any, will be furnished to or made available for the inspection of bidders by the office indicated in the advertisement or invitation.

7. **Corrections.**—Erasures or other changes in the bids must be explained or noted over the signature of the bidder.

8. **Guaranty.**—Where security is required to insure the execution of contract and bond for performance of the service, no bid will be considered unless it is so guaranteed. The bidder, at his option, may furnish a guaranty bond or certified check, or may deposit, in accordance with Treasury Department regulations, bonds or notes of the United States (at par value) as security in the amount required: *Provided*, That where not in conflict with the law, the bidder may be limited to the option of furnishing a certified check or bonds or notes of the United States when the amount of the security does not exceed \$1,000, notice of such requirement to be given in the invitation to bidders.

In case security is in the form of a certified check or bonds or notes of the United States, the Government may make such disposition of the same as will accomplish the purpose for which submitted. Certified checks may be held uncollected at the bidder's risk. Certified checks, or the amount thereof, and bonds or notes of the United States deposited by unsuccessful bidders will be returned as soon as practicable after the opening.

9. **Bonds.**—The bond of any surety company authorized by the Secretary of the Treasury to do business, or of two responsible individual sureties, will be accepted as security for any bid or contract. See the instructions at the end of the applicable standard form bond with respect to the qualifications and sufficiency of sureties and the manner in which bonds should be executed.

10. **Marking and mailing bids.**—Bids with their guaranties, must be securely sealed in suitable envelopes, addressed and marked on the outside as required by the invitation.

11. **Time for receiving bids.**—Bids received prior to the time of opening will be securely kept, unopened. The officer whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered, except that when a bid arrives by mail after the time fixed for opening, but before award is made, and it is shown to the satisfaction of the officer authorized to make the award that the nonarrival on time was due solely to delay in the mails for which the bidder was not responsible, such bid will be received and considered. No responsibility will attach to an officer for the premature opening of a bid not properly addressed and identified. Unless specifically authorized, telegraphic bids will not be considered, but modifications by telegraph of bids already submitted will be considered if received prior to the hour set for opening.

12. **Withdrawal of bids.**—Bids may be withdrawn on written or telegraphic request received from bidders prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

13. **Bidders present.**—At the time fixed for the opening of bids, their contents will be made public for the information of bidders and others properly interested, who may be present either in person or by representative.

14. **Award or rejection of bids.**—The contract will be awarded to the lowest responsible bidder complying with conditions of the invitation for bids, provided his bid is reasonable and it is to the interest of the United States to accept it. The bidder to whom the award is made will be notified at the earliest possible date. The United States, however, reserves the right to reject any and all bids and to waive any informality in bids received whenever such rejection or waiver is in the interest of the United States. It also reserves the right to reject the bid of a bidder who has previously failed to perform properly or complete on time contracts of a similar nature, or a bid of a bidder who is not in a position to perform the contract.

15. **Time of performance.**—When not otherwise specified, the bidder must state the least number of calendar days (counting Sundays and holidays) after date of receipt of notice to proceed, in which he will commence performance, and the number of calendar days (counting Sundays and holidays) after the date of receipt of notice to proceed in which he will complete. In stating time the bidder should make due allowance for probable difficulties which may be encountered.

16. **Bidders interested in more than one bid.**—If more than one bid be offered by any one party, by or in the name of his or their clerk, partner, or other person, all such bids may be rejected. This shall not prevent a bidder from submitting alternative bids when called for, nor from quoting different prices on different qualities of material or different conditions of delivery. A party who has quoted prices on materials to a bidder is not thereby disqualified from quoting prices to other bidders or from submitting a bid directly for the materials or work.

17. **Errors in bid.**—Bidders or their authorized agents are expected to examine the maps, drawings, specifications, circulars, schedule, and all other instructions pertaining to the work, which will be open to their inspection. Failure to do so will be at the bidder's own risk, and he cannot secure relief on the plea of error in the bid. In case of error in the extension of prices the unit price will govern.

18. **Dealer or manufacturer.**—In bids for supplies or manufactured articles, bidders will state whether they are manufacturers of or regular dealers in the articles. If practicable to do so, bidders who are not manufacturers will give the name of the manufacturer from whom the articles are to be obtained, including catalog references.

19. **Samples.**—When samples are required, they must be submitted by the bidder so as to reach the office designated prior to the hour set for opening the bids. Samples shall be furnished free of expense to the Government, properly marked for identification, and accompanied by a list when there is more than one sample. The Government reserves the right to mutilate or destroy any sample submitted whenever it may be considered necessary to do so for the purpose of testing. Samples not so mutilated or destroyed, when no longer required to be retained in connection with the award or delivery of supplies, will be returned, at the bidder's expense, if such return is requested in the bid.

20. **Contract and bond.**—The bidder to whom award is made must, when required, enter into written contract on the standard Government form, with satisfactory security in the amount required, within the period specified or, if no period be specified, within 10 days after the prescribed forms are presented to him for signature.

(These instructions are not to be incorporated in the contract)

**STANDARD GOVERNMENT FORM OF BID BOND**  
(CONSTRUCTION OR SUPPLY)

Know all Men by these Presents, That we, Grote Reber

(See Instructions 4, 5, and 7)

as PRINCIPAL, and

Schuyler C. Reber Jr. and Jean Powers Reber

as SURETY,

(See Instructions 2, 3, 4, and 7)

are held and firmly bound unto the United States of America, hereinafter called the Government, in the penal sum of

Two hundred and fifty dollars

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal has submitted the accompanying bid, dated May 1st, 1947, for

Cosmic Noise Measuring Apparatus as per attached specifications.

Now, THEREFORE, if the principal shall not withdraw said bid within the period specified therein after the opening of the same, or, if no period be specified, within sixty (60) days after said opening, and shall within the period specified therefor, or, if no period be specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Government, in accordance with the bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract, or in the event of the withdrawal of said bid within the period specified, or the failure to enter into such contract and give such bond within the time specified, if the principal shall pay the Government the difference between the amount specified in said bid and the amount for which the Government may procure the required work and/or supplies, if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals this 1st day of May, 1947, the name and corporate seal

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, \_\_\_\_\_, certify that I am the secretary of the corporation named as principal in the within bond; that \_\_\_\_\_, who signed the said bond on behalf of the principal was then of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said corporation by authority of its governing body.

[CORPORATE SEAL]

AFFIDAVIT BY INDIVIDUAL SURETY

STATE OF Illinois  
COUNTY OF DuPage

ss:

I, Schuyler C. Reber Jr., being duly sworn, depose and say that I am one of the sureties to the foregoing bond; that I am a citizen of the United States, and of full age and legally competent; that I reside at 213 W. Seminary Ave., Wheaton and that I am worth in real estate and personal property the sum of one thousand dollars, over and above (1) all my debts and liabilities, owing and incurred, (2) any property exempt from execution, (3) and aggregate full penalties on all other bonds on which I am surety, and (4) any pecuniary interest I have in the business of the principal on said bond; that I own, unincumbered, real estate, the fee of which is in my name, worth \_\_\_\_\_ dollars, located in \_\_\_\_\_; that said property is not exempt from seizure and sale under any homestead law, community, or marriage law, or upon any attachment, execution, or judicial process, and that I am not surety on any other bonds, except as follows:

(State character and amount of each bond. If not on other bonds, so state)

Schuyler C. Reber, Jr.  
(Surety's signature)

Subscribed and sworn to before me this 1st day of May, 19 47,

at Wheaton, Illinois

Schuyler C. Reber, Jr.  
M. E. Witt notary public  
(Title of official administering oath)



[OFFICIAL SEAL]

AFFIDAVIT BY INDIVIDUAL SURETY

STATE OF Illinois }  
COUNTY OF DuPage } ss:

I, Jean Powers Reber, being duly sworn, depose and say that I am one of the sureties to the foregoing bond; that I am a citizen of the United States, and of full age and legally competent; that I reside at 212 W. Seminary Ave., Wheaton and that I am worth in real estate and personal property the sum of one thousand dollars, over and above (1) all my debts and liabilities, owing and incurred, (2) any property exempt from execution, (3) the aggregate full penalties on all other bonds on which I am surety, and (4) any pecuniary interest I have in the business of the principal on said bond; that I own, unincumbered, real estate, the fee of which is in my name, worth                      dollars, located in                     ; that said property is not exempt from seizure and sale under any homestead law, community, or marriage law, or upon any attachment, execution, or judicial process; and that I am not surety on any other bonds, except as follows:

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(State character and amount of each bond. If not on other bonds, so state)  
-----  
-----  
-----

Jean P. Reber  
-----  
(Surety's signature)

Subscribed and sworn to before me this 1st day of May 1947,  
at Wheaton, Illinois

M. E. Witt  
-----  
Notary Public  
-----  
(Title of official administering oath)

[OFFICIAL SEAL]

CERTIFICATE OF SUFFICIENCY

I,                     , do hereby certify that Schuyler C. Reber Jr. one of the sureties named above, is personally known to me, and that, to the best of my knowledge and belief, the facts stated by such surety in the foregoing affidavit are true.

                      
-----  
                      
-----  
(Address)

CERTIFICATE OF SUFFICIENCY

I,                     , do hereby certify that Jean Powers Reber one of the sureties named above, is personally known to me, and that, to the best of my knowledge and belief, the facts stated by such surety in the foregoing affidavit are true.

                      
-----  
                      
-----  
(Address)



## INSTRUCTIONS

1. This form shall be used for construction work or the furnishing of supplies, whenever a bond is required.

2. The surety on the bond for any bid or for the performance of the contract may be any corporation authorized by the Secretary of the Treasury to act as surety, or two responsible individual sureties. Individual sureties shall justify in sums aggregating not less than double the penalty of the bond.

3. A firm, as such, will not be accepted as a surety, nor a partner for copartners or for a firm of which he is a member. Stockholders of a corporate principal may be accepted as sureties provided their qualifications as such are independent of their stock holdings therein. Sureties, if individuals, shall be citizens of the United States, except that sureties on bonds executed in any foreign country, the Canal Zone, the Philippine Islands, Puerto Rico, Hawaii, Alaska, or any possession of the United States, for the performance of contracts entered into in these places, need not be citizens of the United States, but if not citizens of the United States shall be domiciled in the place where the contract is to be performed.

4. The name, including full Christian name, and residence of each individual party to the bond shall be inserted in the body thereof, and each such party shall sign the bond with his usual signature on the line opposite the scroll seal, and if signed in Maine, Massachusetts, or New Hampshire, an adhesive seal shall be affixed opposite the signature.

5. If the principals are partners, their individual names shall appear in the body of the bond, with the recital that they are partners composing a firm, naming it, and all the members of the firm shall execute the bond as individuals.

6. The signature of a witness shall appear in the appropriate place, attesting the signature of each individual party to the bond.

7. If the principal or surety is a corporation, the name of the State in which incorporated shall be inserted in the appropriate place in the body of the bond, and said instrument shall be executed and attested under the corporate seal as indicated in the form. If the corporation has no corporate seal the fact shall be stated, in which case a scroll or adhesive seal shall appear following the corporate name.

8. The official character and authority of the person or persons executing the bond for the principal, if a corporation, shall be certified by the secretary or assistant secretary, according to the form attached thereto. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the secretary or assistant secretary, under the corporate seal, to be true copies.

9. Each individual surety shall justify, under oath, according to the form appearing on the bond, before a United States commissioner, a clerk of a United States court, a notary public, or some other officer having authority to administer oaths generally. If the officer has an official seal it shall be affixed, otherwise the proper certificate as to his official character shall be furnished. Where citizenship is not required, as provided in paragraph 3 of these Instructions, the affidavit may be amended accordingly.

10. The certificate of sufficiency shall be signed by an officer of a bank or trust company, or by a judge or clerk of a court of record, a United States district attorney or commissioner, a postmaster, a collector or deputy collector of internal revenue, or any other officer of the United States acceptable to the department or establishment concerned.

11. The date of the bond must not be prior to the date of the instrument for which it is given.

10-1773

V. 1400 Megacycle Equipment Group

The 1400 megacycle equipment group shall consist of the following pieces of equipment.

A. Cone and drum which shall serve as a focusing device and support for 1400 megacycle amplifier.

B. 1400 megacycle amplifier components with tubes, parts drawings and wiring diagram

C. Power supply unit for operating the 1400 megacycle amplifier with parts drawings, spare tubes and wiring diagram.

D. Cable and Connectors for connecting the power supply to the 1400 megacycle amplifier

E. 1400 megacycle signal generator with parts drawings and wiring diagram

F. Logarithmic Amplifier components

G. Controller and cable

The specifications for the above pieces of equipment are given in the following paragraphs.

A. Cone and Drum

A cone shall be constructed of half hard 1/16" thick aluminum welded and finished at the seam. The cone is to be 45" long, 23" inside diameter at large end and 10 5/16" inside diameter at the small end. A cylindrical flange 1" long and 10 5/16" inside diameter is to be attached to small end. A band 16 1/8" wide shall be fastened to the cone at a distance 7" from large end. The band is to be 45 7/8" plus or minus 1/8" outside diameter and to be mounted on cone by eight equally spaced fins with edges turned up 1/2" in form of shallow box. Fins and band are to be of 1/16" half hard aluminum. Fins are to be spot welded at 1 1/2" intervals to band and cone. This cone is to be so constructed that it will fit into aluminum ring described in part IA and be clamped in place by bracket assembly described in part IIC.

Two drums shall be constructed of half hard 1/16" aluminum with welded and finished seams. They are to be 16" long and 10 5/16" outside diameter. One end is to be closed and other end is to fit snugly into small end of above cone. A 1/2" radius is to be formed at the corner between end and side of cylinder.

B. 1400 megacycle amplifier components

Two cavity resonant circuits suitable for use with type 2C43 tubes at 1400 megacycles shall be supplied. These resonators

are to be of the double cavity type with tube plugging in from one end. The circuit is to be of the grounded grid type. Shell of cavity is to be of copper and the ends are to be of brass. The position of the ends is to be adjustable by means of a fine screw thread and fixed by means of locking nuts. Cavities are to be coupled electrically by means of an iris or short section of waveguide. Provision is to be made for adequate filtering of all power supply leads to prevent feedback.

One similar single cavity resonator is to be provided for use with an X434 diode. It is to be coupled to the other cavities by a similar iris.

Sufficient raw material is to be provided for constructing nine additional double cavities. Four 2C43 tubes and one X434 diode are to be supplied. Complete working drawings of all cavity parts and assembly are to be furnished. At least one sample part is to be provided of all small fittings such as contacts, bushings, washers, entrance holes, covers and end plates

#### C. Power supply unit

The power supply unit shall be of relay-rack mounting construction. Twentyfive Weston type 301 and 476 meters shall be provided. The ranges of the meters are to be suitable for monitoring the voltages and currents of the completed 1400mc amplifier. Potentiometers and switches are to be provided for adjusting individual tube electrode potentials. Two electronically controlled D.C. supplies are to be incorporated suitable for operating the 2C43 tubes or a combination of 2C43 and L-8 tetrode tubes if desired. The regulators are to be 6A3 tubes controlled by a 6J7 DC amplifier tube. Reference voltages are to be "B" batteries. Adequate provision is to be made for heater power. All electrode lines are to be separately fused with suitable fuses.

Separate switches for heater and plate power are to be on front panel. Suitable receptacles are to be provided for power line, reference batteries and cable to amplifier. Tubes and spares with fuses and spares are to be supplied.

The power supply unit shall be mounted in a closed metal cabinet with hinged door at back. Cabinet panel space is to be 19" wide and about 81" high. The cabinet is to be mounted on a suitable four wheel dolly with swivel castors. Eight extra heavy duty castors for constructing additional dollies are to be supplied. Cabinet, dolly, panel of power supply unit are to be black crackle finished.

#### D. Cable and connectors

A shielded weatherproof cable 100 feet long with proper number of conductors shall be supplied for connecting the power supply to the 1400 megacycle amplifier. Suitable connectors are to be provided at both ends.

E. 1400 megacycle signal generator

The signal generator shall supply an unmodulated signal over the approximate frequency range of 1250 megacycles to 1500 megacycles. At least 1.0 volt shall appear across the 50 ohm termination of the output cable at all frequencies. The frequency control dial shall have an expanded scale so that every one half megacycle will occupy approximately 5/16" on the scale. The attenuator shall be of the inductive type and is to be direct reading in DB with a 0.1 DB vernier and supply up to 120 DB of attenuation. No leakage is to exist at the output terminals of attenuator. Three panel meters are to be incorporated into the equipment as follows.

1. Calibration level meter - 3 volts D.C. (200 microampere full scale deflection).
2. Filament voltage meter - 10 volts A.C.
3. Grid current meter - 5 ma. D.C.

Separate heater and plate power switches are to be mounted on the panel along with a line cord receptacle. An eight foot line cord is to be provided also. The plate voltage for the oscillator is to be rectified and thoroly filtered but not regulated.

The attenuator output shall feed into a 50 ohm flexible cable approximately four feet long. The cable shall terminate in a resistor and probe suitable for making measurements on the various stages of the 1400 megacycle amplifier described in paragraph B above.

A low capacity calibration diode shall be mounted on the chassis of signal generator in a suitable fitting to be accessible from side of cabinet so that probe may be easily inserted for calibration purposes. A bucking battery (for the diode velocity potential) and a D.C. calibration zero set potentiometer are to be incorporated into the equipment. A calibration adjustment control is to be supplied on the front panel. The equipment is to be mounted in a suitable steel cabinet with hinged cover and black crackle finish.

Complete wiring diagrams and parts drawings are to be supplied.

F. Logarithmic Amplifier Components

The basic transformers for the D.C. modulation of a 1000 cycle carrier by means of an electronic chopper are to be supplied. This includes two suitable push pull transformers for the modulator and four sets of double tuned 1000 cps. filter couplers. The modulation transformers are to be untuned but have carefully balanced secondaries so that the voltages from each side to center will be of same amplitude and opposite phase. The filter couplers are to be tunable by adjusting the air gaps and coupled by means of

proper mutual inductance or leakage flux so that an overcoupled, flat top type of response curve is obtained. The purpose of this modulator is to generate a 1000 cps voltage whose amplitude is a linear function of the amplitude of the D.C. modulating voltage. This 1000 cps voltage is then to be run thru a logarithmic amplifier using tuned intersage couplers. The above six items should be adequate for the basic components of two logarithmic amplifiers.

G. Controller and cable

One 110 volt, 60 cps, 1 HP reversing controller using two contactors is to be supplied complete with thermal overload switch. A remote control push button box is to be provided with 100 feet of three wire cable and suitable connectors. The cable is to be removable from controller and control box so that the control box may be used near or at a distance from controller.

DEPARTMENT OF COMMERCE  
National Bureau of Standards  
Washington, D.C.

1 OFFICIALS NOT TO BENEFIT

No member of or Delegate to Congress, or Resident-Commissioner, shall be admitted to any share or part of this Contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

2 COVENANT AGAINST CONTINGENT FEES

The contractor warrants that he has not employed any person to solicit or secure this contract upon any agreement for commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Government the right to annul the contract, or in its discretion, to deduct from the contract price of consideration the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to commissions payable by contractors upon contracts or sales secured or made through bonafide established commercial or selling agencies maintained by the contractor for the purpose of securing business.

3 The successful contractors will be required to certify to the following certificate; I certify that the above bill is correct and just; that payment therefor has not been received; that all statutory requirements as to American production and labor standards, and all conditions of purchase applicable to the transactions have been complied with; and that State or local sales taxes are not included in the amounts billed.

4 PRICE CONTROL

The contractor agrees that the price or prices herein for the articles or services to be furnished hereunder are not in excess of any existing applicable maximum prices established by the Office of Price Administration; that he has not and will not pay more than the maximum prices fixed by Federal Authority for any article or material used in connection with the execution of this contract; and that, further, he has not and will not pay more than the maximum wage rate fixed by Federal Authority for any labor used in connection with the execution of this contract.

5 PARTIAL PAYMENTS

Payments for partial deliveries on this order will be considered if complete delivery will be unduly delayed, and the cause for the delay in the opinion of the Bureau is beyond the control of the vendor.

6 The contractor, in performing the work required by this contract, shall not discriminate against any employee or applicant for employment because of race, creed, color or national origin. The contractor shall include in all sub-contracts a provision imposing a like obligation on sub-contractors.

DEPARTMENT OF COMMERCE  
National Bureau of Standards  
Washington, D. C.

1. TAXES, ETC.

Prices bid herein including any Federal tax heretofore imposed by the Congress which is applicable to the material on this bid. If any sales tax, processing tax, adjustment charge or other taxes or charges are imposed or charged by the Congress after the date set forth for the opening of this bid, and made applicable directly upon the production, manufacture, or sale of the supplies covered by this bid, and are paid by the Contractor on the articles or supplies herein contracted for, then the prices named in this bid will be increased or decreased accordingly, any amount due the Contractor as a result of such change will be charged the Government and entered on vouchers (or invoices) as separate items.

2. CONTROL OF PRICES:

"The Contractor agrees that the price or prices herein for the articles or services to be furnished hereunder are not in excess of any existing applicable maximum prices established by the Office of Price Administration; that he has not and will not pay more than the maximum prices fixed by Federal authority for any article or material used in connection with the execution of this contract; and that, further, he has not and will not pay more than the maximum wage rate fixed by Federal authority for any labor used in connection with the execution of this contract."

3. "The contractor, in performing the work required by this contract, shall not discriminate against any employee or applicant for employment because of race, creed, color or national origin. The contractor shall include in all sub-contracts a provision imposing a like obligation on sub-contractors."

4. DOMESTIC MATERIALS:

The contractor, subcontractors, material men, or suppliers shall use only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States, and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced, or manufactured, as the case may be, in the United States, except as otherwise indicated. The term "United States" includes the United States and any place subject to the jurisdiction thereof.



REPRESENTATIONS AND STIPULATIONS PURSUANT TO PUBLIC ACT NO. 846  
74th CONGRESS

(As amended by exemption granted by the Secretary of Labor under date of November 11, 1942 - Federal Register, November 14, 1942 page 9399)

(a) The contractor is the manufacturer of or a regular dealer in the materials, supplies, articles, or equipment to be manufactured or used in the performance of the contract.

(b) All persons employed by the contractor in the manufacture or furnishing of the materials, supplies, articles or equipment used in the performance of the contract will be paid, without subsequent deduction or rebate on any account, not less than the minimum wages as determined by the Secretary of Labor to be the prevailing minimum wages for persons employed on similar work or in the particular or similar industries or groups of industries currently operating in the locality in which the materials, supplies, articles or equipment are to be manufactured or furnished under the contract; Provided, however, that this stipulation with respect to minimum wages shall apply only to purchases or contracts relating to such industries as have been the subject matter of a determination by the Secretary of Labor.

(c) No person employed by the contractor in the manufacture or furnishing of the materials, supplies, articles or equipment used in the performance of the contract shall be permitted to work in excess of 8 hours in any 1 day or in excess of 40 hours in any 1 week unless such person is paid such applicable overtime rate as has been set by the Secretary of Labor; Provided, however, that the provisions of this stipulation shall not apply to any employer who shall have entered into an agreement with his employer who shall have entered into an agreement with his employees pursuant to the provisions of paragraphs 1 or 2 of subsection (b) of section 7 of an act entitled "The Fair Labor Standards Act of 1938"; provided further that in the case of such an employer, during the life of the agreement referred to, the applicable overtime rate set by the Secretary of Labor shall be paid for hours in excess of 12 in any 1 day or in excess of 56 in any 1 week and if such overtime is not paid, the employer shall be required to compensate his employees during that week at the applicable overtime rate set by the Secretary of Labor for hours in excess of 8 in any 1 day or in excess of 40 in any 1 week.

(d) No male person under 16 years of age and no female person under 18 years of age, and no convict labor will be employed by the contractor in the manufacture of production or furnishing of any of the materials, supplies, articles or equipment included in the contract.

(e) No part of the contract will be performed nor will any of the materials, supplies, articles or equipment to be manufactured or furnished under said contract be manufactured or fabricated in any plants, factories, buildings or surroundings or under working

conditions which are insanitary or hazardous or dangerous to the health and safety of employees engaged in the performance of the contract. Compliance with the safety, sanitary and factory inspection laws of the State in which the work or part thereof is to be performed shall be prima facie evidence of compliance with this subsection.

(f) Any breach or violation of any of the foregoing representations and stipulations shall render the part responsible therefore liable to the United States of America for liquidated damages, in addition to damages for any other breach of the contract in the sum of \$10 per day for each male person under 16 years of age or each female person under 18 years of age or each convict laborer knowingly employed in the performance of the contract, and a sum equal to the amount of any deductions, rebates, refunds or underpayment of wages due to any employee engaged in the performance of the contract; and, in addition, the agency of the United States entering into the contract shall have the right to cancel same and to make open market purchases or enter into other contracts for the completion of the original contract, charging any additional cost to the original contractor. Any sums of money due to the United States of America by reason of any violation of any of the representations and stipulation of the contract as set forth herein may be withheld from any amount due on the contract or may be recovered in a suit brought in the name of the United States of America by the Attorney General thereof. All sums withheld or recovered as deductions, rebates, refunds or underpayments of wages shall be held in a special deposit account and shall be paid, on order of the Secretary of Labor, directly to the employees who have been paid less than minimum rates of pay as set forth in such contracts and on whose account such sums were withheld or recovered; Provided, that no claims by employees for such payments shall be entertained unless made within 1 year from the date of actual notice to the contractor of the withholding or recovery of such sums by the United States of America.

(g) The contractor shall post a copy of the stipulation in a prominent and readily accessible place at the site of the contract work and shall keep such employment records as are required in the Regulations under the act available for inspection by authorized representatives of the Secretary of Labor.

(h) The contractor is not a person who is ineligible to be awarded government contracts by virtue of sanctions imposed pursuant to the provisions of section 3 of the Act.

(i) No part of the contract shall be performed and none of the materials, articles, supplies or equipment manufactured or furnished under the contract shall be manufactured or furnished by any person found by the Secretary of Labor to be ineligible to be awarded Government contracts pursuant to Section 3 of the Act.

(j) The foregoing stipulations shall be deemed inoperative if this contract is for a definite amount not in excess of \$10,000.

COSMIC NOISE MEASURING APPARATUS

Cosmic Noise Measuring Apparatus capable of receiving, detecting and recording the amplitude of electromagnetic radiations of extra-terrestrial origin at various angles of arrival and azimuth at the frequencies of 160 megacycles and 480 megacycles respectively. The complete apparatus for the purpose of description is divided into four groups of equipment designated as follows:

I. Radiation Collector Equipment Group.

II. 160 Megacycle Equipment Group.

III. 480 Megacycle Equipment Group.

IV. Recorder System Equipment Group.

The equipment contained within these four equipment groups when taken together are to form the complete Cosmic Noise Measuring Apparatus. No additional equipment or modifications are to be required for efficient operation.

I. Radiation Collector Equipment Group

The Radiation Collector Equipment Group shall consist of the following pieces of equipment:

- A. Radiation Collector
- B. Remote Control Unit (Field Operation)
- C. Remote Control Unit (Station Operation)
- D. Cable and Connectors
- E. Access Platform or ladder assembly
- F. Ground Wire
- G. Ground Rods

A. Radiation Collector

The Radiation Collector shall consist of a metallic parabolic reflector suitably mounted on a meridian transit type carriage assembly, all of which shall be mounted on a motor driven turntable assembly for continuously varying the azimuth angle. The turntable assembly shall be designed for mounting on a concrete foundation (foundation not supplied). Necessary mechanical and electrical equipment shall be incorporated into the Radiation Collector such that the angle of azimuth for which the reflector is set may be varied and controlled remotely by either the Remote Control Unit (Field Operation) described in paragraph IB or by the Remote Control Unit (Station Operation) described in paragraph IC. Also incorporated into the construction of the Radiation Collector shall be an equipment supporting structure which shall provide a rigid mechanical mount for the appropriate receiving and antenna equipment described in sections II and III. The parabolic reflector shall serve as a collector

for the cosmic radiation which is reflected to the focus of the parabola. In the vicinity of the focal point the radiations are received and detected by the receiving equipment. The receiving equipment is supported mechanically by the equipment supporting structure in the manner to be described below:

The parabolic antenna or reflector shall be a full paraboloid of revolution 31 feet 4 inches in diameter with a focal length of 20 feet. It shall be constructed of 24 gauge metal of good conductivity such as galvanized iron. The construction of the antenna and necessary supporting equipment shall incorporate sufficient reinforcement so that the antenna will not depart more than plus or minus one-half inch from the specified paraboloid of revolution.

The electronic equipment supporting structure shall terminate in an aluminum ring of 46 1/8 inches in outside diameter and 1 1/8 inch. The bottom of this ring, which shall serve as a support for the electronic equipment, will be at a distance of 21 feet 1 inch above the bottom (center) of the parabola of revolution. The portion of the supporting structure above the parabolic reflector shall be of open wooden frame work construction. No nails are to be used in its assembly. All fastenings are to be by screws or small machine bolts and light gusset plates. Hinges are to be provided at both ends of the structure for ease of assembly.

The equipment will be used to measure the intensity of cosmic radiation for various angles of arrival and azimuth. The carriage assembly shall be so designed and equipped that the plane of the parabolic antenna may be tilted 90 degrees from its normal horizontal position in one direction (corresponding to zero degrees angle of arrival with the horizontal) and 45 degrees from its normal horizontal position in the opposite direction (corresponding to 135 degrees angle of arrival). Sufficient cross bracing shall be incorporated in the carriage to limit the deformation to plus or minus one-half inch at any position of tilt.

The turntable assembly and associated mechanical drive assembly shall be motor driven and remote controlled. The equipment shall be capable of smoothly and reliably turning the antenna assembly through 360 degrees of rotation in azimuth. A lock or brake mechanism shall be provided to prevent movement of the carriage in the wind.

The speed of rotation of the turntable assembly shall be adjustable from 1/100 rpm to 1/5 rpm and controllable from the panel of the control unit. Provision shall be made for reversing the direction of rotation.

The Radiation Collector shall be of rugged mechanical and electrical design and shall be capable of reliable operation outdoors in all normal weather conditions. A complete supply of machine bolts, screws, fasteners, 40/60 solder, flux, hardware and materials necessary for assembly are to be supplied. Major equipment components shall be supplied in knock down form suitably marked with complete drawings clearly locating the position of each part so that the structure may be easily erected. All wood members used shall be of kiln dried low moisture content straight grained wood, free from knots. Spruce, fir, hemlock or redwood are acceptable.

All wood members shall be painted with two coats of aluminum paint. All gusset plates are to be painted with one coat of aluminum paint before assembly.

B. Remote Control Unit (Field Operation)

The Remote Control Unit (Field Operation) shall consist of a remote control switch, for starting, stopping and reversing the direction of rotation of the reflector turntable assembly together with 300 feet of flexible weatherproof coated cable. This cable is to connect to part C below.

C. Remote Control Unit (Station Operation)

The Remote Control Unit (Station Operation) shall be of standard 19" relay rack or cabinet construction and shall be supplied completely wired. A detailed wiring and connection diagram shall be supplied. The direction of rotation of the reflector turntable shall be indicated by means of pilot lights, or some other suitable indicating device on the control panel. The electrical equipment shall be provided with a thermal overload switch and standard protective devices. A normally open single pole relay is to be provided which operates from 110 volts D.C. and will break a 110 V. A.C. 1/4 ampere current circuit. The relay is to be used in conjunction with position marker pen on the recorder (not supplied). Suitable capacitors shall be connected across appropriate relay and switch contacts to prevent arcing. Suitable cable receptacles are to be provided on the control unit for all external connections.

D. Cable and Connectors

Seven hundred and fifty feet of flexible weatherproof cable shall be provided for electrical connections between the Radiation Collector and the Remote Control Unit (Station Operation). Suitable connectors shall be supplied.

E. Access Platform or Ladder Assembly

A suitable access platform or ladder assembly shall be supplied so that operating personnel may conveniently and safely obtain access to the aluminum ring of the equipment supporting structure for the purpose of installing, removing or making adjustments in the radio equipment mounted thereon.

F. Ground Wire

A heavy copper ground wire shall be provided for connecting together and grounding the metallic parts of the Radiation Collector such as the aluminum ring of the equipment supporting structure, the metallic portions of the mirror and the metal work of the carriage and turntable assemblies.

G. Ground Rods

Ten 1/2" diameter pointed copperweld ground rods 8 feet long with ground clamps attached shall be supplied for driving into the ground at 36° intervals around the base of the Radiation Collector.

II. 160 Megacycle Equipment Group

The 160 megacycle equipment group shall consist of the pieces of equipment outlined briefly below and described in greater detail in succeeding paragraphs:

- A. A metallic drum which shall serve as a focusing device and as a support for the 160 megacycle amplifier.
- B. An antenna and transmission line assembly mounted inside the drum.
- C. A mounting bracket assembly for fastening the drum to the equipment supporting structure of the Radiation Collector.
- D. A 160 megacycle amplifier which mounts on the drum, together with spare tubes, wiring diagrams, drawings and special tools and jigs.
- E. A protecting can for sheltering the 160 Mc amplifier unit from the effect of the weather.
- F. A power supply unit remotely located to supply power to the 160 megacycle amplifier together with spare tubes, diagrams and accessories.
- G. A cable and connectors for connecting the 160 megacycle amplifier to the power supply unit.
- H. A 160 megacycle signal generator.
- I. A 160 megacycle wavemeter.

The specifications for the above pieces of equipment are given in the following paragraphs:

A. Metallic Drum

The metallic drum shall be constructed of half hard 1/16" aluminum with welded and finished seams. The outside diameter of the drum shall be 45-7/8 plus or minus 1/8 inches. Its overall length shall be 60 inches. Three removable and interchangeable aluminum ends shall be provided and shall fit snugly inside the bottom or "open" end of the drum. One shall be of 1" x 1" x 1/8" angle rolled, leg in and welded at the joint. The other two shall be of 1/16" plate with a flange spun over at the outside edge. These plates shall have center holes respectively 15" and 23" in

diameter with a 1" lip spun out on the side of the plate opposite the outside flange. The top or "closed" end of the drum shall contain a mounting which shall hold the 160 megacycle amplifier. This mounting shall provide a suitable lip to attach a watertight cover which shall be placed over the amplifier. The mounting shall also contain mechanical and electrical connections for the 160 megacycle amplifier and shall have terminals for the transmission line assembly described below.

B. Antenna and transmission line assembly.

The antenna shall be of the bi-conical dipole type designed for 160 megacycle operation. The cones shall be of 1/16" aluminum stock and shall have a 15-1/2 degree angle of revolution. The cones shall be mounted so that the axis of the antenna shall be parallel to and 16" from the closed end of the drum. The transmission line shall consist of two suitably spaced 5/16" diameter aluminum tubes bolted to the cones and terminated at suitably insulated terminals in the center of the mounting on the closed end of the drum.

C. Mounting Bracket Assembly

The mounting bracket assembly shall consist of mounting brackets and 2 aluminum bands. The brackets shall mount on the aluminum ring of the equipment supporting structure of the Radiation Collector. The brackets shall support aluminum bands 4" above and below the aluminum ring so that when the drum is placed in the ring and clamped tightly by the aluminum bands, its lower or "open" end shall be 13 inches below the bottom edge of the ring.

D. 160 Megacycle Amplifier

The 160 megacycle amplifier shall consist of five cascade amplifier stages using type 954 acorn tubes. The output stage shall work into a type 9004 diode rectifier. Interstage couplers shall be of the double tuned type and shall provide an overall bandwidth such that the amplifier shall tune from 156 to 164 megacycles at the 3 db down points. The primary, secondary and coupling elements of these interstage couplers shall be of the distributed constant, coaxial transmission line type. The desired band pass shall be achieved without the use of any coupler damping resistance other than the input resistance of the acorn tubes. The five interstage couplers are to be arranged para-axially around a circle of 3-1/8" radius from center of circle to axis of coupler. The tubes shall mount on copper partitions between couplers; successive stage tubes shall be at opposite ends of the assembly. The interstage shall be fastened at top and bottom by a suitably cut sheet of 1/16" copper. All permanent joints in the assembly shall be silver soldered. The input coupler shall be a single tuned coaxial circuit 6" long at the center of the assembly. Its outer conductor shall be a copper tube 2 inches in diameter. The antenna shall be coupled to this circuit by means of two large loops connected in series aiding located at the bottom of the coupler and at opposite sides of the inner conductor. These loops shall be proportioned so that optimum coupling for best signal-to-noise ratio shall be obtained and so that the transmission line coming from the drum will be properly terminated. Adequate radio frequency by-pass condensers shall be incorporated in all power and diode return leads so that any of these may be brought into close proximity to the antenna lead with no

trace of feedback. Adequately tight and easily removable covers shall be provided to all openings so that no trace of regeneration exists due to external feedback. The gain measured from the first grid to diode rectifier shall be 90 db or greater. The mechanical mounting shall be such that it may be easily attached to the mounting plate on the closed end of the drum by three thumb nuts. This connection shall be rigid mechanically and shall automatically make all power and antenna connections. The diode return line shall terminate separately in a microphone connector attached to the side of the assembly.

Thirty type 954 and ten type 9004 acorn tubes shall be supplied with the amplifier.

Suitable wooden jigs for holding the amplifier in position for bench tests and cables for connecting amplifier to power supply and test equipment shall be supplied.

Complete wiring diagram, performance data, parts drawings and all special tools and jigs used in constructing the amplifier shall be supplied.

#### E. Protective Can

The protective can shall consist of a watertight aluminum can 16" long and 10 5/16" outside diameter to protect the amplifier from the weather when it is mounted on the drum. The inside of the can shall be lined with insulating material such that no part of the can may touch the amplifier assembly. Provision shall be made for mounting and removing the protective can in a simple manner.

#### F. Power Supply Unit

The power supply unit shall be of standard relay-rack mounting construction. Five meters, Weston type #301 and #476 or equivalent are to be incorporated into the equipment as follows:

1. 300 v. D.C. (plate voltage), 1 m.a. movement
2. 30 m.a. D.C. (plate current)
3. 15 m.a. D.C. (screen current)
4. 150 v. D.C. (screen voltage) 1 m.a. movement
5. 10 v. A.C. (heater voltage).

Plate and screen voltages are to be provided from a small filtered electronically regulated supply using 90 volts obtained from batteries as a reference voltage. The regulator tube shall be a 6A3 tube controlled by a 6J7 D.C. amplifier tube. Two extra heavy-duty 45 volt "B" batteries shall be provided external to the power supply and connected thereto by a suitable cable which will plug into a receptacle on the panel.



Separate ten point step switches shall be provided for controlling plate and screen potentials. Ripple is not to exceed 0.1% into the 6A3 regulator tube.

The heaters shall be regulated by a saturable reactor type of regulating transformer with bucking winding. Enough paper condensers shall be mounted under the chassis to completely correct the power factor of this heater transformer. Heater potential control shall be provided by a shunt rheostat across the heaters. Heater regulation shall be not more than 0.1% for a plus or minus 2% change in line voltage. Separate heater and plate power switches shall be provided on the panel. Receptacles for cable to amplifier, cable to batteries, and cable to line shall be provided on panel. A line cord 8 feet in length shall be included.

A Sola 120 watt regulating transformer or equivalent shall be provided as an external attachment.

Complete wiring diagrams, parts drawings, performance data and two sets of spare tubes shall be supplied.

#### G. Weatherproof Multiconductor Cable

Weatherproof multiconductor cable 100 feet in length shall be supplied for connecting the 160 megacycle amplifier described in paragraph D to the power supply unit described in paragraph F. Two of the conductors shall be a high grade microphone cable. A total of six conductors are required for this cable. A good grade of heavy cotton wrap with impregnation shall be applied over all rubber insulation to reduce the decomposing effect of ultraviolet solar radiation. Suitable cable connectors shall be provided.

#### H. Signal Generator

The signal generator shall supply an unmodulated signal over the frequency ranges 140 megacycles to 190 megacycles. It shall supply an output voltage of at least one volt maximum across a 30 ohm cable. Controls for frequency, attenuation (direct reading is desirable), and calibration level shall be provided on the panel. The attenuator shall be of the inductive type and shall provide values of attenuation up to 120 DB with no trace of leakage. Three panel meters shall be incorporated into the equipment as follows:

1. Calibration level meter - 1 volt D.C. (100 microamperes for full scale deflection).

2. Plate Current Meter - 100 milliamperes D.C.

3. Filament Voltage Meter - 3 volts A.C.

A power switch shall be mounted on the panel. A line cord receptacle together with 8 feet of line cord shall be provided. The plate voltage shall be rectified and thoroughly filtered.

The attenuator output shall feed into a 30 ohm flexible cable approximately four feet long. The cable shall terminate in an R.F. head and flexible probe suitable for making measurements on the various stages of the 160 megacycle amplifier described in paragraph D, above.

The R.F. head shall contain a line terminating resistor and a suitable rectifier tube for measuring calibration level. Heater power to and rectifier D.C. leads from the rectifier tube shall be incorporated into the cable. A bucking battery (the diode detector velocity potential) and a D.C. calibration zero set potentiometer shall be incorporated into the equipment.

Complete wiring diagrams, parts drawings, calibration data and two sets of spare tubes shall be supplied.

I. A lecher wire type wavemeter capable of determining frequencies over the range 140-190 megacycles shall be supplied.

### III. 480 Megacycle Equipment Group

The 480 megacycle equipment group shall consist of the pieces of equipment outlined briefly below and described in greater detail in succeeding paragraphs:

A. Metallic container which shall serve as a focusing device and as a support for the 480 megacycle amplifier described in paragraph D.

B. An antenna and transmission line assembly mounted inside the container.

C. A mounting bracket assembly for fastening the container to the equipment supporting structure of the radiation collector.

D. A 480 megacycle amplifier which mounts on the container, together with spare tubes, wiring diagrams, drawings and accessories.

E. An amplifier cover which protects the amplifier units from effects of weather.

F. A power supply unit remotely located to supply power to the 480 megacycle amplifier together with spare tubes, diagrams and accessories.

G. A cable and connectors for connecting the 160 megacycle amplifier to the power supply unit.

H. A 480 megacycle signal generator.

I. A 480 megacycle wavemeter.

The pieces of equipment outlines above shall meet the following specifications:

A. Metallic Container

The metallic container constructed of copper, shall be composed of a cylinder 13" in radius and 3" in length with the top end closed by a hemisphere 13" in radius. Fastened to the closed end shall be a mounting plate which shall serve as a mount for the 480 megacycle amplifier and as a termination for the antenna transmission line.

B. Antenna and Transmission Line Assembly

The antenna shall be of the bi-conical dipole type designed for 480 megacycle operation. The cones shall be of copper stock and shall have a 15 degree angle of revolution. The antenna shall be mounted inside the metallic container so that the tips of the cones shall be identical with the center of the hemisphere and the axis of the cones shall be parallel to the plane of the container opening. The transmission line shall consist of suitable parallel copper bars and shall terminate at properly insulated terminals on the container mounting plate.

C. Mounting bracket assembly

The mounting bracket assembly shall serve to support the metallic container from the aluminum ring of the equipment supporting structure of the Radiation Collector. The mounting bracket assembly shall support the container in a position such that the center of the hemisphere (and the tips of the cones) shall be 13" below the bottom edge of the aluminum ring and on a vertical line through the center of the ring.

D. The 480 megacycle amplifier

The 480 megacycle amplifier shall have an overall gain from antenna terminals to detector of not less than 110 DB and shall consist of at least seven cascade triode stages connected as grounded grid triode amplifiers. The receiver noise figure shall not be greater than 7 DB referred to KTB with the dummy antenna resistor at 300 degrees Kelvin. The overall band width shall be approximately 8 megacycles at the 3 DB points. Adequate by-pass and filter capacitors shall be provided in all tube element return leads. Suitable provision shall be made for making all necessary mechanical, power, d.c. and radio frequency connections with the metallic container, the mounting bracket assembly and the connecting cable. Provisions shall also be made for attaching the amplifier cover described in paragraph E. Suitable weather shields shall be provided for covering cable connectors after cables are attached. All circuits shall be efficiently neutralized when required.

Two sets of spare tubes shall be supplied. A complete set of parts drawings, performance data, and wiring diagrams are to be included. Two suitable wooden jigs are to be provided for holding the amplifier in position for bench tests. Cables for connecting amplifier to power supply and test equipment shall also be supplied.

E. Amplifier Cover

An aluminum cover with welded and finished seams shall be provided for protecting the amplifier from the weather. Provision shall be made for mounting the amplifier cover on the 480 megacycle amplifier unit.

F. Power Supply Unit

The power supply unit shall supply all power necessary to operate the 480 megacycle amplifier. Suitable Weston type 301 and 476 instruments or equivalent, are to be provided on the panel for the following functions:

<u>Range</u>	<u>Purpose</u>
25 W.A.	Each individual tube plate current
150 V.A.C.	Line voltage
2 amp. A.C.	Line current
15 V. A. C.	Heater Voltages
250 V. D.C. (1 m.a. movement)	Plate supply potential
100 m.a. D.C.	Total plate supply current
150 V.D.C. (200 microamps movement)	Plate voltages

A switch shall be provided for reading the plate voltages of the individual stages with the plate voltage meter. Individual controls shall be provided for the plate voltage of each tube. Controls shall also be provided for heater and plate supply voltages. Plate power shall be supplied from a well filtered electronically regulated supply. Regulating transformers shall be provided to maintain constant heater voltage. Heater regulation shall be not greater than 0.1% for a plus or minus 2% variation in line voltage.

Separate heater and plate power switches and pilot lights shall be provided on the panel. Receptacles for cables to the 480 megacycle amplifier and to the 110 volt A.C. power line shall be incorporated into the equipment. A 250 watt line regulating transformer shall be provided as an external attachment. The power supply shall be equipped with protective fuses.

Complete wiring diagrams, parts drawings and performance data shall be supplied.

Two sets of spare tubes, eight pilot lights and 100 spare 1/32 ampere Littlefuses or equivalent shall be supplied.

The power supply unit shall be mounted in a closed metal cabinet with hinged door at the back. Cabinet panel space shall be 19" wide and at least 42" high. The cabinet shall mount on a suitable four wheel dolly with swivel castors.

#### G. Cable and Connectors

A shielded weatherproof cable 100 feet in length shall be provided for connecting the 480 megacycle amplifier to the 480 megacycle power supply unit. All rubber insulation shall be covered by a wax impregnated cotton wrap to reduce the decomposing effect of ultraviolet solar radiation. Suitable connectors shall be provided at both ends of the cable.

#### H. 480 Megacycle Signal Generator

A signal generator shall cover the frequency range 360 megacycles to 560 megacycles. This signal generator shall be similar to an RCA type 1026A except that the attenuator shall be removable from the front panel and sufficient output shall be available for the calibration level to be 0.316 volts. Three separate attenuator slides shall be provided as follows:

1. Slide with pickup loop and 36" of RG8U cable terminating in a 50 ohm resistor mounted on a probe for making tests on the amplifier.

2. Slide with pickup loop and balanced 38 ohm rigid line 12" long terminating in two 19 ohm resistors with center tap grounded, mounted on suitable probe.

3. Slide with 50 ohm pickup resistor and 50 ohm balanced line, 12" long terminating in a suitable fitting for attaching to amplifier antenna terminals.

A separate antenna termination shall be provided for amplifier consisting of a light bulb with 50 ohms resistance at 2700 degrees absolute. The bulb shall be connected across the antenna terminals and provided with chokes and by-passes such that an external DC source may light up bulb to 2700 degrees without affecting the R.F. balances of antenna terminals to ground.

#### I. 480 Megacycle Meter

A frequency meter covering the range 300 megacycles to 600 megacycles Lavaie type 105 or equivalent, shall be supplied.

#### IV. Recorder System Equipment Group

The Recorder System Equipment Group shall consist of the pieces of equipment outlined below:

- A. A Recorder Unit which shall amplify the d.c. signals from the amplifier unit and provide a continuous record of the cosmic noise data.

B. A Monitor Unit for observing the output of the Recorder Unit from a remote location.

C. Accessories, supplies and spare parts for the above equipment.

The equipment shall meet the specifications which follow:

A. Recorder Unit

The Recorder Unit shall consist of a D.C. amplifier and a 5 milliamperes d.c. recorder mounted in a closed steel cabinet having an available panel space 19 inches wide and at least 42 inches high. The cabinet shall be mounted on a steel dolly with four swivel casters.

The D.C. amplifier shall be equivalent to the General Radio type 715A. It shall be mounted on the panel of the Recorder Unit with the frame insulated from the panel.

The Recorder Unit shall incorporate a bucking control circuit consisting of a 50 microampere D.C. meter (3" case Triplett or equivalent), an eleven step switch with ten 500 ohm wire wound resistors between points, a 750 ohm potentiometer, an on-off switch and a suitable battery or supply. The circuit shall be able to counteract any voltage indicated on 5 volt meter.

Mounted on the panel shall be an audio volume control and two headphone jacks.

A 5 milliamperes D.C. recorder equivalent to the Esterline-Angus type AW5 shall be mounted on the panel. The recorder shall be supplied with a marker pen in the right margin. Also mounted on the panel shall be switches for turning the recorder movement on and off. The recorder drive motor shall be incorporated into the equipment.

Suitable receptacles shall be provided for input, output and power connections. A line cord 8 feet in length for connection to a 110 volt A.C. source shall be supplied.

B. Monitor Unit

The monitor unit shall consist of a Weston type 301 5 milliamperes D.C. meter or equivalent in a metal case mounted in a slant type portable case. At the back of the case shall be a headphone type plug attachment for observing the output of the D.C. amplifier at a remote location. 100 feet of two conductor heavy duty rubber covered cord with standard power line type fittings shall be supplied as an extension cord. A wooden frame for winding up extension cord, shall be provided. Adaptors to convert line fittings to microphone fittings shall be supplied for use with the portable 5 milliamperes meter.

C. Accessories, Supplies

An extra set of syringes, three extra pen points, an extra pint of red ink and 30 extra rolls of Esterline-Angus type 4305 x chart paper or equivalent shall be supplied. 1000 extra empty chart roll boxes shall be included.

Two sets of headphones shall be supplied.

Two complete sets of spare electron tubes, five spare ballast tubes, six spare fuses and a dozen spare pilot lights shall be supplied for the D.C. amplifier.

Complete wiring diagrams, parts drawings (except of D.C. amplifier and recorder) and performance data shall be supplied.

# PERFORMANCE BOND

(CONSTRUCTION OR SUPPLY)

Know all Men by these Presents, That we,

(See Instructions 4, 5, and 7)

as PRINCIPAL, and

as SURETY,

(See Instructions 2, 3, 4, and 7)

are held and firmly bound unto the United States of America, hereinafter called the Government, in the penal sum of

dollars

for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract, hereto attached, with the Government, dated \_\_\_\_\_, 19\_\_\_\_, for

NOW THEREFORE, If the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Government, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, the name and corporate seal of each



corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In presence of—

PERFORMANCE BOND  
(CONSTRUCTION OR SUPPLY)

-----	----- [SEAL]
	(Individual principal)
-----	-----
(Address)	(Business address)
-----	----- [SEAL]
	(Individual principal)
-----	-----
(Address)	(Business address)
-----	----- [SEAL]
	(Individual principal)
-----	-----
(Address)	(Business address)
-----	----- [SEAL]
	(Individual principal)
-----	-----
(Address)	(Business address)
-----	----- [SEAL]
	(Individual surety)
-----	-----
(Address)	(Business address)
-----	----- [SEAL]
	(Individual surety)
-----	-----
(Address)	(Business address)

Attest:

-----	-----
	(Corporate principal)
-----	-----
	(Business address)
-----	----- [AFFIX CORPO-]
By	RATE SEAL

Attest:

-----	-----
	(Corporate surety)
-----	-----
	(Business address)
-----	----- [AFFIX CORPO-]
By	RATE SEAL

The rate of premium on this bond is \_\_\_\_\_ per thousand.

Total amount of premium charged, \$ \_\_\_\_\_

(The above must be filled in by corporate surety)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, \_\_\_\_\_, certify that I am the secretary of the corporation named as principal in the within bond; that \_\_\_\_\_, who signed the said bond on behalf of the principal, was then \_\_\_\_\_ of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said corporation by authority of its governing body.

----- [CORPORATE SEAL]

AFFIDAVIT BY INDIVIDUAL SURETY

STATE OF \_\_\_\_\_ }  
COUNTY OF \_\_\_\_\_ } ss:

I, \_\_\_\_\_, being duly sworn, depose and say that I am one of the sureties to the foregoing bond; that I am a citizen of the United States, and of full age and legally competent; that I am by occupation a \_\_\_\_\_, for \_\_\_\_\_ last past doing business at \_\_\_\_\_ in \_\_\_\_\_ and residing at \_\_\_\_\_ in \_\_\_\_\_; that I am worth in real estate and personal property the sum of \_\_\_\_\_ dollars over and above (1) all my debts and liabilities, owing and incurred, (2) any property exempt from execution, (3) any pecuniary interest I have in the business of the principal on said bond, and (4) any interest I have in any so-called community property; that I am the sole owner in fee simple of certain real estate described as follows, which is located at

(a) \_\_\_\_\_  
(Description of property)

that the fair valuation of said real estate is (\$ \_\_\_\_\_); that the assessed value of that property for taxation purposes is (\$ \_\_\_\_\_); that said property is not exempt from seizure and sale under any homestead law, community, or marriage law, or upon attachment, execution, or judicial process; that the mortgages or other encumbrances against said real estate are the following:

(b) \_\_\_\_\_

and that there are no encumbrances against said real estate other than as above stated; that my liabilities owing and incurred do not exceed \$ \_\_\_\_\_; in addition to the real property above described, I am worth the sum of \$ \_\_\_\_\_ over and above my just debts and liabilities in property subject to execution and sale, and that the additional personal property consists of the following:

(c) \_\_\_\_\_  
(Describe personal property fully)

and that there are no encumbrances against said real estate other than as above stated; that my liabilities owing and incurred do not exceed \$ \_\_\_\_\_; in addition to the real property above described, I am worth the sum of \$ \_\_\_\_\_ over and above my just debts and liabilities in property subject to execution and sale, and that the additional personal property consists of the following:

(c) \_\_\_\_\_  
(Describe personal property fully)

That I am not surety on any other bonds, except as follows:

(d) \_\_\_\_\_  
(State character and amount of each bond. If not on other bonds, so state)

That I am not a partner in the business of the principal on the bond or bonds on which I appear or may appear as surety. This affidavit is made to induce the United States of America to accept me as surety on the foregoing bond.

(Signed) \_\_\_\_\_  
(Surety's signature)

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_,

at

[OFFICIAL SEAL] \_\_\_\_\_

(Title of official administering oath)

NOTE.—See Instruction No. 10 before executing the following certificates.

**CERTIFICATE OF SUFFICIENCY**

I HEREBY CERTIFY, That \_\_\_\_\_, one of the sureties named above, is personally known to me; that, in my judgment, said surety is responsible, and qualified to act as such; and that, to the best of my knowledge and belief, the facts stated by said surety in the foregoing affidavit are true.

\_\_\_\_\_  
(Official title)

\_\_\_\_\_  
(Address)

**CERTIFICATE OF SUFFICIENCY**

I HEREBY CERTIFY, That \_\_\_\_\_, one of the sureties named above, is personally known to me; that, in my judgment, said surety is responsible, and qualified to act as such; and that, to the best of my knowledge and belief, the facts stated by said surety in the foregoing affidavit are true.

\_\_\_\_\_  
(Official title)

\_\_\_\_\_  
(Address)

## INSTRUCTIONS

1. This form shall be used for construction work or the furnishing of supplies, whenever a bond is required. There shall be no deviation from this form except as authorized by the Director of Procurement.

2. The surety on the bond for any bid or for the performance of the contract may be any corporation authorized by the Secretary of the Treasury to act as surety, or two responsible individual sureties. Each individual surety shall justify in a sum not less than the penalty of the bond.

3. A firm, as such, will not be accepted as a surety, nor a partner for copartners or for a firm of which he is a member. Stockholders of a corporate principal may be accepted as sureties provided their qualifications as such are independent of their stock holdings therein. Sureties, if individuals, shall be citizens of the United States, except that sureties on bonds executed in any foreign country, the Canal Zone, the Philippine Islands, Puerto Rico, Hawaii, Alaska, or any possession of the United States, for the performance of contracts entered into in these places, need not be citizens of the United States, but if not citizens of the United States shall be domiciled in the place where the contract is to be performed.

4. The name, including full Christian name, and residence of each individual party to the bond shall be inserted in the body thereof, and each such party shall sign the bond with his usual signature on the line opposite the scroll seal, and if signed in Maine or New Hampshire, an adhesive seal shall be affixed opposite the signature.

5. If the principals are partners, their individual names shall appear in the body of the bond, with the recital that they are partners composing a firm, naming it, and all the members of the firm shall execute the bond as individuals.

6. The signature of a witness shall appear in the appropriate place, attesting the signature of each individual party to the bond.

7. If the principal or surety is a corporation, the name of the State in which incorporated shall be inserted in the appropriate place in the body of the bond, and said instrument shall be executed and attested under the corporate seal as indicated in the form. If the corporation has no corporate seal the fact shall be stated, in which case a scroll or adhesive seal shall appear following the corporate name.

8. The official character and authority of the person or persons executing the bond for the principal, if a corporation, shall be certified by the secretary or assistant secretary, according to the form attached thereto. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the secretary or assistant secretary, under the corporate seal, to be true copies.

9. Each individual surety shall justify, under oath, according to the form appearing on the bond, before a United States commissioner, a clerk of a United States court, a notary public, or some other officer having authority to administer oaths generally. If the officer has an official seal it shall be affixed, otherwise the proper certificate as to his official character shall be furnished. Where citizenship is not required, as provided in paragraph 3 of these Instructions, the affidavit may be amended accordingly.

10. Each certificate of sufficiency shall be signed by an officer of a bank or trust company, a judge or clerk of a court of record, a United States district attorney or commissioner, a postmaster, a collector or deputy collector of internal revenue, or any other officer of the United States acceptable to the department or establishment concerned.

Further certificates as to the financial qualification of the sureties may be required from time to time; which certificates must be based on the personal investigation of the certifying officers at the time of the making thereof, and not upon prior certificates.

11. The date of the bond must not be prior to the date of the instrument for which it is given.

**INVITATION, BID, AND ACCEPTANCE**  
 (SHORT FORM CONTRACT)

(Department or establishment)

(Office or station)

(Address)

(Date)

**INVITATION**

Sealed bids, in ..... subject to the conditions on the reverse hereof, will be received at this office until ..... o'clock ..... m., ..... and then publicly opened, for furnishing the following supplies, and/or services, for delivery at .....

(Name)

(Title)

ITEM No.	ARTICLES OR SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT	
					Dollars	Cents

**BID**

(Date)

In compliance with the above invitation for bids, and subject to all the conditions thereof, the undersigned offers, and agrees, if this bid be accepted within ..... calendar days from the date of the opening, to furnish any or all of the items upon which prices are quoted, at the price set opposite each item, delivered at the point(s) as specified and, unless otherwise specified within ..... calendar days after receipt of order.

Discounts will be allowed for payment as follows: ..... percent 10 calendar days; ..... percent 20 calendar days; ..... percent 30 calendar days.

Bidder ..... Address .....

By ..... Title .....  
 (Signature of person authorized to sign this bid)

**ACCEPTANCE BY THE GOVERNMENT**

(Date)

Accepted as to items numbered .....

Name ..... Title .....

## CONDITIONS

1. The Government reserves the right to reject any or all bids, to waive any informality in bids and, unless otherwise specified by the Government or by the bidder, to accept any item in the bid. In case of error in the extension of prices in the bid, the unit prices will govern.

2. Time, in connection with discount offered, will be computed from date of the delivery of the supplies to carrier when final inspection and acceptance are at point of origin, or from date of delivery at destination or port of embarkation when final inspection and acceptance are at those points, or from date correct bill or voucher properly certified by the contractor is received if the latter date is later than the date of delivery.

3. In case of default of the contractor, the Government may procure the articles or services from other sources and hold the contractor responsible for any excess cost occasioned thereby: *Provided*, That if public necessity requires the use of materials or supplies not conforming to the specifications they may be accepted and payment therefor shall be made at a proper reduction in price.

4. If the contractor refuses or fails to make deliveries of the materials or supplies within the time specified, or any extension thereof, the Government may by written notice terminate the right of the contractor to proceed with deliveries or such part or parts thereof as to which there has been delay. In such event, the Government may purchase similar materials or supplies in the open market or secure the manufacture and delivery of the materials and supplies by contract or otherwise, and the contractor and his sureties (if any) shall be liable to the Government for any excess cost occasioned the Government thereby: *Provided*, That the contractor shall not be charged with any excess cost occasioned the Government by the purchase of materials or supplies in the open market or under other contracts when the delay of the contractor in making deliveries is due to unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God or of the public enemy, acts of the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, and delays of a subcontractor due to such causes unless the contracting officer shall determine that the materials or supplies to be furnished under the subcontract are procurable in the open market, if the contractor shall notify the contracting officer in writing of the cause of any

such delay, within 10 days from the beginning thereof, or within such further period as the contracting officer shall, with the approval of the head of the department or his duly authorized representative, prior to the date of final settlement of the contract, grant for the giving of such notice. The contracting officer shall then ascertain the facts and extent of delay, and his findings of fact thereon shall be final and conclusive on the parties hereto, subject only to appeal within 30 days by the contractor to the head of the department concerned or his duly authorized representative, whose decision on such appeal as to the facts of delay shall be final and conclusive, on the parties hereto. As used herein "head of the department" means the head or any assistant head of the executive department or independent establishment involved, and "his duly authorized representative" means any person authorized to act for him other than the contracting officer; and the term "contracting officer" shall include his duly appointed successor or his authorized representative.

5. No Member of or Delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom unless it be made with a corporation for its general benefit.

6. Prices bid herein include any Federal tax heretofore imposed by the Congress which is applicable to the material on this bid. If any sales tax, processing tax, adjustment charge, or other taxes or charges are imposed or changed by the Congress after the date set for the opening of this bid, and made applicable directly upon the production, manufacture, or sale of the supplies covered by this bid, and are paid by the contractor on the articles or supplies herein contracted for, then the prices named in this bid will be increased or decreased accordingly, and any amount due the contractor as a result of such change will be charged to the Government and entered on vouchers (or invoices) as separate items.

7. Unless otherwise specified by the bidder, it is understood and agreed that only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States, and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced, or manufactured, as the case may be, in the United States shall be delivered pursuant to a contract awarded as a result of this bid.

## INSTRUCTIONS TO BIDDERS

1. Samples of items, when required, must be furnished, free of expense, prior to the opening of bids, and, if not destroyed, will, upon request, be returned at the bidder's expense.

2. Prices should be stated in units of quantity specified, with packing included.

3. Time of proposed delivery must be stated in definite terms. If time varies for different items the bidder shall so state.

4. Envelops containing bids must be sealed and marked on the upper left-hand corner with the name and address of the bidder and the date and hour of opening, and addressed as instructed.

5. For further instructions read U. S. Standard Form 22 (Instructions to Bidders).

## INSTRUCTIONS TO CONTRACTING OFFICERS

1. If shipment is made by Government bill of lading, observe consolidated classification requirements so as to secure the lowest rate applicable.

2. Although this form meets the requirements of a formal contract (R. S. 3744), if the execution of a formal contract with bond is contemplated U. S. Standard Forms 31 and 32 should be used.

3. If there is not sufficient space on the schedule to list all of the items, insert at the bottom of the schedule "Continued on ----- sheets of U. S. Standard Form 36", and use that form also.

4. If it is definitely known that final acceptance cannot be accomplished within 10 or 20 days from date of delivery due to necessity for tests or analyses which cannot be accomplished within that time, delete, before issuance, the discount provision relating to 10 calendar days or to both 10 and 20

calendar days. The provision relating to discounts may also be deleted when funds do not become available so that payment may be made within such time limits.

5. If the contract is likely to involve patent liability, the article on patents as contained in U. S. Standard Form 32 should be used.

6. If the contract provides for liquidated damages, the above Condition No. 4 should be deleted and there should be substituted therefor the article entitled "Delays—Liquidated Damages", quoted in Paragraph 5 of the directions on page 6, U. S. Standard Form 32, modified as follows: Delete "in Article 1", line 2, and if no bond is required, delete "and his sureties", lines 6 and 10; add the last sentence (definitions) of the above Condition No. 4.

#### NOTE

The Government shall have the right to inspect and test all materials, supplies and equipment. Therefore, final acceptance will not be made until completion of test. If discount for prompt payment is offered, the discount period will begin with the date of final inspection and acceptance if such date is later than the receipt of properly certified invoice or voucher.