

NATIONAL INSTITUTE OF GOVERNMENTAL PURCHASING, INC.

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NIGP Purchase Description
Tractors, Industrial, with
Loader and Backhoe
As Revised March 12, 1982

This suggested purchase description has been prepared by the National Institute of Governmental Purchasing, Inc. (NIGP), in cooperation with the Federal Supply Service, G.S.A., local and state government purchasing agencies, and industry representatives. It includes a maximum exterior sound level requirement and a bid evaluation formula which considers purchase price, exterior sound level, fuel costs, preventative maintenance costs, guaranteed maintenance price, and the guaranteed buy back price offered.

1. SCOPE AND CLASSIFICATION:

1.1 SCOPE: This purchase description is for industrial tractors with front-end loader and backhoe, as defined in 2.1 (industrial tractors), 2.2 (loaders), and 2.3 (backhoe).

1.2 CLASSIFICATION: Diesel, gasoline, or propane powered, with enclosed cab.

2. APPLICABLE PUBLICATIONS:

2.1 SAE J1057, "Identification Terminology of Earthmoving Machines," of latest issue.

2.2 SAE J732, "Specification Definitions - Front End Loader," of latest issue.

2.3 SAE J49, "Specification Definitions - Hydraulic Backhoes," of latest issue.

2.4 SAE J1040, "Performance Criteria for Roll Over Protective Structure (ROPS) for Construction, Earthmoving, Forestry, and Mining Machinery," of latest issue.

2.5 Federal, State, and Local OSHA Requirements, of latest issue.

2.6 SAE J725, "Slow Moving Vehicle Identification Emblem," of latest issue.

2.7 SAE J919, "Measurement of Sound Level at Operator Station of Construction and Industrial Machinery," of latest issue.

2.8 SAE J88, "Exterior Sound Level Measurement Procedure for Earthmoving Machinery," of latest issue.

2.9 SAE J816, "Engine Test Code-Spark Ignition and Diesel," of latest issue.

2.10 SAE J742, "Capacity Rating-Loader Bucket," of latest issue.

2.11 SAE J296, "Excavator Hoe Bucket Rating," of latest issue.

- 2.12 SAE J343, "Tests and Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies," of latest issue.
- 2.13 SAE J1179, "Hydraulic Excavator Digging Forces," of latest issue.

3. REQUIREMENTS:

3.1 PERFORMANCE: This machinery is to be used at construction sites and for maintenance and repair work on roads, bridges, and water and sewer mains. It must be able to travel to and from scattered job sites under its own power and be suitable for travel over public roads.

3.2 INDUSTRIAL TRACTOR:

3.2.1 Engine:

- 3.2.1.1 Diesel, gasoline, or propane powered, as specified in the Invitation for Bids, with horsepower, also as specified in the Invitation for Bids.
- 3.2.1.2 Electrical system, as specified in the Invitation for Bids.
- 3.2.1.3 Oil and air filters, as specified in the Invitation for Bids.
- 3.2.1.4 Exhaust to be protected from entry of water to engine.

3.2.2 Transmission and Clutch: As specified in the Invitation for Bids.

3.2.3 Wheels and Tires: As specified in the Invitation for Bids.

3.2.4 Indicators: To include:

- 3.2.4.1 Tachometer
- 3.2.4.2 Hourmeter
- 3.2.4.3 Charging Systems
- 3.2.4.4 Fuel
- 3.2.4.5 Engine Temperature
- 3.2.4.6 Oil Pressure
- 3.2.4.7 Air Cleaner Restriction

3.2.5 Alarm System: If specified in the Invitation for Bids.

3.2.6 Operating Cab:

- 3.2.6.1 To be all-weather, fully enclosed, and equipped with a roll-over protection structure in accordance with 2.4.
- 3.2.6.2 Shall be complete with safety glazing, seat belts, heater, defroster, front and rear windshield wipers, beacon or strobe light (as specified in the Invitation for Bids) mounted on roof with inside operating switch, padded seat, foot throttle, door locks, and dome light.

3.2.7 Power Steering: Required

3.2.8 Braking: Adequate for the intended use of the equipment.

3.2.9 Safety:

- 3.2.9.1 General: Must meet Federal, State and Local OSHA Requirements applicable to the intended use of the equipment (2.5).

3.2.9.2 Items: To include:

- 3.2.9.2.1 Lights and reflectors
- 3.2.9.2.2 Rearview mirrors of the size and type specified in the Invitation for Bids.
- 3.2.9.2.3 Rear fenders designed to prevent throwing of debris.
- 3.2.9.2.4 Horn, to be button type, and designed for over-the-road service.
- 3.2.9.2.5 Back-up warning, to sound intermittently when tractor is in reverse gear.
- 3.2.9.2.6 Slow moving vehicle emblem, in accordance with 2.6.
- 3.2.9.2.7 Charged 5 lb., ABC fire extinguisher, with bracket, to be furnished and installed in the cab.

3.2.10 Vandal Protection Items: To include motor shields, lockable fuel tanks, and lockable battery box.

3.2.11 Tool Compartment: To be manufacturer's standard.

3.2.12 Roadability: Machine must be suitable for travel to and from job sites, and for travel over roads. Traveling speed, as specified in the Invitation for Bids.

3.2.13 Road and Ground Clearance: As specified in the Invitation for Bids.

3.2.14 Minimum Weight: As specified in the Invitation for Bids.

3.2.15 Operator Station Sound Level: Bidder shall provide sound level in decibels (A Scale) measured in accordance with 2.7 while machinery is operating at rated engine speed, stationary, with doors closed. Failure to provide this information will result in bid being considered non-responsive.

3.2.16 Exterior Sound Level: Shall not exceed 83 decibels (A Scale) measured in accordance with 2.8 while machinery is operating at rated engine speed, stationary. As explained in Attachment A, a special bid evaluation formula will be used to determine the successful bidder. It includes an incentive for offering tractors that are quieter than the noisiest models bid. Bidders must state the noise level of the unit offered. Otherwise, their bid will be considered non-responsive and, consequently, will not be considered in the determination of the successful bidder.

3.2.17 Fuel Efficiency: The special bid evaluation formula described above also includes an incentive for offering tractors that are energy efficient. Bidders must state the fuel consumption rate of the unit offered at gross full-load horsepower at manufacturer's rated speed in accordance with 2.9. (NOTE: NIGP intends to work with the University of Nebraska Tractor Test Laboratory and interested manufacturers to develop a more representative fuel consumption rate measurement procedure).

3.3 LOADER:

- 3.3.1 Bucket: Type, width, and capacity, as specified in the Invitation for Bids. Capacity is to be in accordance with 2.10.
- 3.3.2 Breakout Force: As specified in the Invitation for Bids, in accordance with 2.2.
- 3.3.3 Lift Capacity: As specified in the Invitation for Bids, in accordance with 2.2
- 3.3.4 Self-Leveling Mechanism: Shall have self-leveling mechanism float position, return to dig.

3.4 BACKHOE:

- 3.4.1 Bucket: Manufacturer's standard, of the width and capacity specified in the Invitation for Bids. Capacity is to be in accordance with 2.11.
- 3.4.2 Dipper Stick: If specified in the Invitation for Bids, shall be equipped with hydraulically operated, extendable dipperstick capable of increasing digging depth to depth specified in accordance with 2.11.
- 3.4.3 Bushing: Shall be replaceable.
- 3.4.4 Hydraulic Hoses: Burst pressure in accordance with 2.12. To be as specified in the Invitation for Bids.
- 3.4.5 Outriggers: Individually controlled hydraulic, including one set of standard stabilizer pads and one set of street rubber pads. Combination type pads are acceptable.
- 3.4.6 Operator's Seat: Padded and adjustable, regular or combination type.
- 3.4.7 Arc of Swing: Shall be 180 uninterrupted degrees minimum.
- 3.4.8 Digging Depth: As specified in the Invitation for Bids, in accordance with ICED.
- 3.4.9 Digging Force: As specified in the Invitation for Bids, in accordance with 2.13
- 3.4.10 Loading Height: As specified in the Invitation for Bids, in accordance with 2.3.

3.5 GENERAL:

- 3.5.1 Other Bid Evaluation Factors: In addition to purchase price, the value of noise reduction, and the cost of energy, the bid evaluation formula referred to in 3.2.16 and 3.2.17, and described in Attachment A, also considers the following:

- 3.5.1.1 Preventative Maintenance Costs. The government will follow the normal, published manufacturer's "operator preventative maintenance schedule," using the parts and accessories recommended by the manufacturer. Bidders must list these recommended parts and accessories, and provide their individual and total cost. Failure to do so will result in the bid being considered non-responsive. The contractor may make periodic inspections of the equipment on site, and ascertain to his satisfaction that proper preventative maintenance procedures are being carried out.
- 3.5.1.2 Guaranteed Maintenance Price. With the exception listed by the government in the Invitation for Bids, the contractor is responsible for maintaining the equipment during its useful life. Bidders must provide a NOT TO EXCEED guaranteed maintenance price for the 5 year, 6000 hour period, whichever comes first, to cover the maintenance, parts (except those listed under 3.5.1.1, "Preventative Maintenance Costs), and labor and transportation (whether performed on-site or at the contractor's service facility) necessary to keep the unit in full intended use and operation. This "not to exceed price" will be considered in bid evaluation, and must be provided if a bid is to be considered responsive. Repairs will be billed as incurred up to the guaranteed maximum price bid. Invoices for repairs in excess of this guaranteed maximum price will be rendered with an offsetting credit so that accurate repair cost records may be maintained.
- 3.5.1.3 Guaranteed Buy Back Price Offer. Bidders must indicate in their bid what they would be willing to pay the government for this equipment at the end of the 5 year, 6000 hour period, whichever comes first. Failure to provide this information will result in the bid being considered non-responsive. Actual "buy back" will be at the government's option.

3.5.2 Instructions:

- 3.5.2.1 Operation, maintenance, and instruction plates or durable decals shall be located in a conspicuous place near controls.
- 3.5.2.2 Contractor shall provide factory shop manual, parts manual, schematic drawing of electrical wiring system, lubrication chart, and operator's manual for each unit shipped.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES:

- 4.1 SAMPLES: Unless otherwise specified in the Invitation for Bids, no bid samples will be required.
- 4.2 INSPECTION: Upon receipt, each unit shall be inspected for condition and specification compliance by a government representative prior to acceptance. If a unit has to be rejected for any reason, the selling dealer shall be required to pick up the unit at the point of delivery, accomplish necessary repairs, and return the unit to the original point of delivery. If desired and if space is available, the repairs may be accomplished on government property; this will be at the discretion of the government.

4.3 TESTING:

- 4.3.1 Testing for noise level shall be in accordance with 2.7 and 2.8.
- 4.3.2 Verification for noise level and testing of other specification requirements may be performed at the discretion of the contracting activity as indicated in the Invitation for Bids. Such tests shall be performed on bid samples or samples taken from contractor's shipments. In the event products tested fail to meet requirements of this specification, the cost of samples used in testing and the cost of testing shall be borne by the supplier.
- 4.3.3 Bidders must certify with each bid that the model being offered has been tested in accordance with paragraph 2.4 and 2.5; and, a copy of the laboratory test reports must be included with the certifications provided. Requests for certification of noise levels for the same year shall be required unless there has been a design change affecting noise level output.
- 4.3.4 Testing for the various performance requirements shall be in accordance with the procedures referenced.

5. PREPARATION FOR DELIVERY:

- 5.1 In all matters of detail, including those not specifically covered by these specifications, the work shall be professionally and skillfully accomplished in accordance with the best trade customs and professional standards of work of like character and purpose, as generally recognized by trade standards.
- 5.2 Each unit shall be completely assembled, adjusted, serviced, clean and ready for continuous heavy duty service. Servicing shall include, but is not limited to, complete lubrication and inclusion of enough anti-freeze in the liquid cooling system of each water cooled engine to protect to the minimum °F specified in the Invitation for Bids. Servicing adjustment, assembly, etc., shall be to the satisfaction of the government.
- 5.3 All standard equipment, as shown on the manufacturer's specification sheet, shall be included in the quoted base price, except as specified in the Invitation for Bids.

6. NOTES:

- 6.1 DEVIATIONS: Any deviation from this purchase description must be indicated in the Invitation for Bids.
- 6.2 AVAILABILITY OF DOCUMENTS:
 - 6.2.1 SAE Standards are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.
- 6.3 OPTIONS: Where various options are available under this purchase description, the Invitation for Bids will specify the option required.

6.4 BID EVALUATION CRITERIA: As noted above a special bid evaluation formula will be used to determine the successful bidder. Attachment "A" to this purchase description contains this formula and explains how it will be used.

Attachment "A" to:
NIGP Purchase Description
Backhoe Loader Tractors
September 18, 1981

"BUY QUIET"/LIFE CYCLE COST - BID EVALUATION FORMULA

Purpose

The purpose of this formula is to permit the (City, County, etc) to purchase a quieter backhoe loader tractor with a lower total cost of ownership. In effect, it allows a bidder to offer a competitive bid on a unit which may be slightly more expensive to acquire initially, but which will make less noise and cost less to own and operate during its useful life.

Method

The formula will be used to calculate an "evaluated" bid price for each bidder's offer; and, evaluated bid prices, rather than "actual" bid prices, will be compared in the determination of the lowest and best bidder. As stated in the body of the purchase description, each bidder must provide information regarding operator station sound level, exterior sound level, fuel consumption rate, preventative maintenance costs, guaranteed maintenance costs, and guaranteed "buy back" offer. This information, with the exception of operation station sound level, is necessary for the calculation of evaluated bid price for each unit offered.

Formula and Criteria

The formula for determining "evaluated bid price" is:

$$EBP = P - VNR + CE + PMC + GMP - GBB$$

Where:

EBP = Evaluated Bid Price

P = Actual Bid Price

VNR = Value of (Additional) Noise (i.e., Exterior Sound Level) Reduction (when compared to the noisiest model offered "Responsively": that is, "meeting the noise level and other requirements of the Invitation for Bids.")

CE = Cost of Energy (i.e., gasoline, diesel, or propane fuel) to operate the unit during its projected life.

PMC = Preventative Maintenance Cost

GMP = Guaranteed Maintenance Price

GBB = Guaranteed Buy Back Price

VNR is calculated by the (City, County, etc.) using this formula:

$$VNR = Y (PAV) (NN - N)$$

Where:

Y = The percentage factor by which the purchasing activity will "reward" (or "compensate") the bidder for each decibel that his unit is quieter than the noisiest model offered responsively. For purposes of this procurement Y shall be _____%, expressed as _____.

PAV = The Average of the Actual Bid Prices for all models offered responsively. In cases where a bidder offers one or more alternatives, the model with the lowest noise level and meeting the requirements of the Invitation for Bids shall constitute his sole offer.

NN = The Exterior Sound (Noise) Level in decibels (A Scale) of the noisiest model offered responsively.

N = The Exterior Sound (Noise) Level in decibels (A Scale) of the model offered by the bidder whose EBP is being determined.

CE is calculated by the (City, County, etc) using this formula:

$$CE = FC \times AOH \times PLY \times CEG$$

Where:

FC = The fuel consumption rate of the unit offered, expressed in "gallons per hour."

AOH = The projected annual operating hours for the unit.

PLY = The projected life of the unit, expressed in years.

CEG = The cost of energy (i.e., diesel or gasoline fuel), expressed in dollars per gallon.

In this purchase:

AOH = _____ (to be provided by government)

PLY = _____ (to be provided by government)

CEG = _____ (to be provided by government)

(Refer to 3.2.17, "Fuel Efficiency.")

PMC is equal to the quoted total cost of the parts and accessories recommended by the manufacturer in its normal, published "operator preventative maintenance schedule".

(Refer to 3.5.1.1, "Preventative Maintenance Costs.")

GMP is equal to the quoted NOT TO EXCEED guaranteed maintenance price, in accordance with 3.5.1.2, "Guaranteed Maintenance Price."

GBB is equal to the guaranteed buy back price offer described in 3.5.1.3,

"Guaranteed Buy Back Price Offer."

Sample Calculation of Evaluated Bid Price (EBP)

In response to the government's Invitation for Bids, four bidders submit offers containing the information shown below in the "raw" bid tabulation.

City of Anywhere

"Raw" Bid Tabulation
Loader Backhoe Tractors

March 6, 1982

<u>Bidder</u>	<u>P</u>	<u>N(dBA)</u>	<u>FC(gph)</u>	<u>PMC</u>	<u>GMP</u>	<u>GBB</u>
A	\$23,695	81	2.6	\$1,925	\$10,000	\$17,000
B	\$25,750	80	2.4	\$1,900	\$ 9,500	\$17,500
C	\$28,700	79	2.2	\$1,875	\$ 9,000	\$18,000
D	\$30,455	79	2.2	\$1,875	\$ 8,250	\$18,500

The government has indicated in the IFB that the bid evaluation formula explained in Attachment A is to be used to determine the successful bidder. The government has also stated in the IFB that:

Y = 2% (calculated as .02)
 AOH = 520 (hours)
 PLY = 7 (years)
 CEG = \$1.25

Step One: Calculate VNR (using the formula $VNR = Y (PAV) (N_N - N)$)

For Bidder A: $VNR = .02 (\$27,150) (81-81)$
 $= \$543 (0)$
 $= 0$

For Bidder B: $VNR = .02 (\$27,150) (81-80)$
 $= \$543 (1)$
 $= \$543$

For Bidder C: $VNR = .02 (\$27,150) (81-70)$
 $= \$543 (2)$
 $= \$1,086$

For Bidder D: $VNR = .02 (\$27,150) (81-79)$
 $= \$543 (2)$
 $= \$1,086$

(to determine PAV, add \$23,695; \$25,750; \$28,700; and, \$30,455; then divide the sum by 4. N_N is the noise level of the noisiest model offered responsively. In this case it is 81, for Bidder A).

Step Two: Calculate CE (using the formula $CE = FC \times AOH \times PLY \times CEG$)

$$\begin{aligned} \text{For Bidder A: CE} &= 2.6 \times 520 \times 7 \times \$1.25 \\ &= \$11,830 \end{aligned}$$

$$\begin{aligned} \text{For Bidder B: CE} &= 2.4 \times 520 \times 7 \times \$1.25 \\ &= \$10,920 \end{aligned}$$

$$\begin{aligned} \text{For Bidder C: CE} &= 2.2 \times 520 \times 7 \times \$1.25 \\ &= \$10,010 \end{aligned}$$

$$\begin{aligned} \text{For Bidder D: CE} &= 2.2 \times 520 \times 7 \times \$1.25 \\ &= \$10,010 \end{aligned}$$

Step Three: Calculate EBP

(Insert the values provided by the bidder for P, PMC, GMP and GBB, and the values calculated by the purchasing agency for VNR and CE into the formula, $EBP = P - VNR + CE + PMC + GMP - GBB$).

$$\begin{aligned} \text{For Bidder A: EBP} &= \$23,695 - \$0 + \$11,830 + \$1,925 + \$10,000 - \$17,000 \\ &= \$30,450 \end{aligned}$$

$$\begin{aligned} \text{For Bidder B: EBP} &= \$25,750 - \$543 + \$10,920 + \$1,900 + \$9,500 - \$17,500 \\ &= \$30,027 \end{aligned}$$

$$\begin{aligned} \text{For Bidder C: EBP} &= \$28,700 - \$1,086 + \$10,010 + \$1,875 + \$9,000 - \$18,000 \\ &= \$30,499 \end{aligned}$$

$$\begin{aligned} \text{For Bidder D: EBP} &= \$30,455 - \$1,086 + \$10,010 + \$1,875 + \$8,250 - \$19,500 \\ &= \$30,004 \end{aligned}$$

Step Four: Prepare "Revised" Bid Tabulation:

<u>Bidder</u>	<u>P</u>	<u>EBP</u>
A	\$23,695	\$30,450
B	\$25,750	\$30,027
C	\$28,700	\$30,499
D	\$30,455	\$30,004

Step Five: Award Contract to Lowest "Evaluated" Bidder:

Contract would be awarded to Bidder D based on his EBP of \$30,004. Government would pay a contract price of \$30,455.