MISSOURI DEPARTMENT OF TRANSPORTAION
SPECIFICATION FOR 20-TON HYDRAULIC TRUCK MOUNTED CRANE

GENERAL

The intent of this specification is to describe a truck mounted hydraulic crane unit that will provide positive load lift and placement control quickly and safely.

MOUNTING

The crane is to be center mounted on the truck chassis directly behind the truck cab. The mounting shall be done in accordance with the latest recommended manufacturing and business practice. It shall have all necessary supports to prevent overloading of chassis wheels and bearings when extended and working in extreme positions. It shall be stability tested and ready to use.

BASKET

Steel basket 72” x 42” on 4’ yoke extension, gravity hung, and adjustable lock. Basket manually rotates 90 degrees each side, and includes quick-attach boom attachment.

Crane (General)

This crane is to be a hydraulically operated, telescoping crane and shall meet SAE J765 stability requirements with an 85% tipping factor at maximum rated capacities when mounted on a factory recommended chassis.

This crane shall be designed, manufactured and tested complying to the applicable portions of ANSI B30.5, OSHA 1926.550, AWS D14.3 and SAE J-1063. The manufacturer shall maintain appropriate test results to verify compliance to these regulations.

This crane is to have a height of not more than 157" when mounted on a 38" chassis frame. It shall not exceed 96" in width.

The main frame shall be box construction of materials capable of supporting the turret, with separate outriggers. The crane shall incorporate a torsion-resisting sub base which bolts to the crane frame and runs the length of the chassis frame to tie-in with the rear stabilizers. The sub base shall reduce the need for frame reinforcement and/or counterweight.

Controls
The crane shall be equipped with dual operation control stations. The winch and boom control lever orientation is to be identical on each side of the crane for easy control identification. Each station is to consist of: a foot operated throttle, kill switch, horn, control levers, and load charts.

The control levers shall be installed 40" to 50" in height above the platform. The non-skid steel control platform shall be provided with a step for easy access. A glycerin filled pressure gage to monitor all hydraulic pressure shall be installed at one operation station. A level bubble shall be installed at both operator stations on a surface parallel to the swing bearing. Each operator station shall be provided with durable weatherproof capacity, instruction and safety placards appropriately describing the crane function.

Hydraulic System - The crane shall be equipped with one 3 section pump (2 section vane and one 1 section gear) hydraulic system: one gear and two vane. The crane hydraulic pump shall be one (PTO powered), high pressure, capable of 3900 PSI operating pressure. The control valve shall be of the "direct acting/sliding spool type" with flow output of approximately 30 GPM to the winch, 18 GPM to the crane functions, and 10 GPM to rotation. The operator control levers will be directly connected to the valve spools and the valve positioners will be 4-way spring centered. Spools shall have metering notches to limit flow to the limits specified above and be of the low force type. Cylinder port relief valves, as required, shall be set below the maximum system operating pressure. All high pressure hydraulic hoses shall be of a steel braid reinforced construction with a 4:1 safety factor. O-ring face seal hose fittings shall be used on all high pressure circuits. The chassis frame mounted reservoir shall be provided with a clean out port, removable magnetic plug and a 10 micron return line filter. 100% filtration is to be provided. The reservoir capacity shall not be less than 100 gallons. Hydraulic System Capacity is 125 gallon. Hydraulic System is equipped with a shut off valve.

Crane and turret
The crane shall be hydraulically powered and controlled. It must be four sections, telescopic, (no manual pull out sections), with rotating turret on truck mounted fixed steel base. The turret shall rotate and position rated loads up and down at approximately a 5% grade. Quotations will be accepted on units with turrets having 375-degree non-continuous rotation accomplished by a high efficiency planetary gear or equal type drive.

The crane shall have a minimum sheave height of 90' when mounted on the truck chassis. The crane shall elevate from approximately 80 degrees above horizontal to approximately 9 degrees below horizontal.

Boom

The boom telescoping section shall be of the 4-plate type with perpendicular welded corners. All corner welds shall be ultrasonically tested for proper penetration. The boom shall be a 4 - section design and telescope hydraulically on nylon pads impregnated with molybdenum disulfide. Extension and retraction of the boom shall be proportional. Holding valves shall be used on all cylinders to prevent retraction except when under power. The boom shall have the ability of being hydraulically extended to a maximum sheave height of: 90 ft. Retracted length shall not exceed 24'.

The main boom shall be designed to accept 2 steel sheaves in the lower sheave case. The boom shall be designed to accept jibs and shall be equipped with a quick-reeve boom tip.

The capacities of the boom shall meet the following minimum requirements, at each boom section, while meeting all SAE J-765 stability test requirements.

Min. Capacity at Height above Ground

Capacity	Height
40,000#	36'
8,550#	88'

Min. Cap. Loaded Line Radius

Capacity	Reach
40,000#	5'
27,100#	8'
22,400#	10'
19,500#	12'
17,100#	14'
3,450#	50'
3,000#	55'
2,550#	60'
2,150#	65'

The boom shall be provided with a mechanical angle indicator mounted near the operator station in additional to the electric angle indicator on the LMI.

A removable boom rest shall be provided for use during transportation. Load charts for full and mid-span outrigger extensions are to be provided.

Rotation

The boom shall be capable of being rotated a minimum of 375 degrees. The rotation system shall consist of a planetary gear box with a spring applied hydraulically released brake. The brake shall have the ability to slip through to reduce impact loads on the rotation system. The drive gear shall maintain full tooth contact with the rotation gear without the necessity of adjustment. The turret and main frame mounting surface for the bearing shall be machined after welding. Rotation gear is to be attached to the crane frame by use of high strength bolts for ease of service. A full circle bolt pattern between the main frame, rotation bearing and turret shall be used for equal load distribution. The rotational system shall be capable of rotating, holding, and restarting capacity loads up a 5 degree slope. Rotation shall be 375 degree non-continuous with cushioned rotation stop. The rotation gear box shall be located internally within the crane frame. The swing speed valve shall be adjustable for varying applications.

Outriggers

The crane shall be equipped with "H" Style out-and-down outriggers located on each side of the crane frame. They are to be of boxed type construction and can be deployed for Retracted, Mid-Span (10'-0") and Full-Span of (17'-4") load charts. Manual Locks provided for Mid-Span. The "H" outrigger is integral to torsion box. Outrigger will have removable aluminum foot pads with a surface area of 452 square inches. The foot pads shall be provided with stow brackets mounted on each vertical outrigger cylinder. The outrigger must have the capacity of providing a minimum of 14 in. of ground penetration when mounted on a chassis frame height of 38 in.

Winch

The crane shall be equipped with a boom mounted planetary type winch. A hydraulic motor with planetary gear reduction will provide "power down" load lowering. The load line shall be of no less than 325 ft. of 9/16" rotation resistant 19.25 ton breaking strength wire rope. A downhaul weight/non-swivel hook and two-and-three part line block shall be included. This crane shall be equipped with a device to help prevent sheave case and/or cable damage by sensing the position of the winch cable end attachments with respect to the sheave case. This system shall interrupt and shut down the "winch up" and/or "telescope out" functions that can cause "two-blocking". This system shall be located internally within the boom. Audible warning systems are unacceptable.

Cylinders

All cylinders on the crane shall be double acting with shaft packings of polyurethane U-cup type. Shafts shall be high yield, stress relieved and chrome plated. Piston sets shall be of polyurethane U-cup type with glass reinforced nylon bearings. Cylinder barrels shall be constructed of micro-honed tubing. Holding valves shall be provided to prevent cylinder from retracting unless under power.

Stabilizers

The crane will be provided with RSOD stabilizers mounted behind the rear tires. They shall be of a box type construction. The cylinders shall be fully enclosed to prevent debris from entering the cylinder. The stabilizers shall have Retracted, Mid-Span (10'-0") and Full-Span (16'-0") horizontal with 20" vertical movement. Stabilizers are to be used in conjunction with a standard mount configuration.

For 360 degree working area, the crane must be supplied with an SFO-Single front Stabilizer. The SFO is a center front mounted vertical hydraulic jack allowing 360 degree operating capability. The SFO is to be controlled from the outrigger control locations and be capable of tilting 90° for truck chassis with tilting hoods.

Load Moment Indicator
The crane shall be equipped with a ***Load Moment Indicator***. This system shall consist of a combination central micro processor unit with operating display console, length/angle sensor, pressure transducers and internal anti two block system.

The LMI shall have WADS (Work Area Definition System).

The LMI shall operate on the principle of a comparison of actual value, resulting from the force or pressure measurement during crane operation, compared to reference data stored in the central processor memory.

A display console shall be in full view of the operator. This LMI console shall be capable of displaying actual operating data to include load radius, load on load line, boom angle, boom length, tip height. A bar graph shall be provided on display providing a visual aid depicting the amount of crane capacity being utilized.

The LMI, when properly used, will provide assistance to the operator as an operational aid which alerts the crane operator of approaching overload conditions with the main boom or jib and also warns of over hoist conditions which could cause damage to equipment or personnel. Any crane function that will increase the load radius plus winch up of the load shall be interrupted when maximum capacity is reached. An audible warning shall also be sounded to warn of an overload.

Audio visual devices only are not acceptable.

Options (weight of opts. not included in total weight)
The crane shall be designed to accept as a minimum the following equipment which can be added at any time during the life of the crane:

Miscellaneous Options

The crane shall be designed to accept as a minimum the following equipment which can be added at any time during the life of the crane:

1. Line blocks for increased lifting capabilities
2. Radio remote controls
3. Winch drum rotation indicator
4. Winch 3rd wrap indicator
5. Clam bucket reel and controls
6. Tool boxes and mounting brackets
7. Oil Cooler both regular and duty cycle cooler options
8. Delete overhaul weight
9. Outrigger in motion alarm

Color
Standard Manufacture color

Rear Hitch Plate and Pintle Hitch
The ¾" thick steel rear hitch plate must be securely welded and gusseted to rear of frame rails and include two (2) rear tow hooks, glad-hands, J560 trailer connection, and (2) DOT "D" rings with 20-ton capacity each. A Premier model 235 hitch must be installed in rear hitch plate approximately 24" centerline height above ground plus or minus 1". The J560 trailer connection shall be furnished with cab and chassis and relocated on hitch plate.

Platform bed
Overall width of platform bed shall not exceed 102".
Overall length shall be 18'.

Body frame to be all steel welded into single unit.
Structural steel 3" channel crossmembers on 12" centers for maximum strength and welded to side rails.
Stake pockets at 24" centers with spacers between the pockets with 3" x 3/8" rubrail on sides and rear.
Floor shall be steel 3/16" treadplate over 1 ½" ship-lapped oak floor.
Recessed rubber grummet weather tight and impact reflectorized lights and reflectors at four corners.
42" tall steel removable bulkhead with a barred window and chain holder.
The entire bed primed and painted with 2 coats of Dupont Automotive enamel.
The outer frame will be constructed of 5" structural channel facing inward.
The outer heavy rubrail will be used for straps and chains.
Three (3) lockable tool boxes measuring 24" H x 24" D x 48" L (or 36" L, depending on available space) are to be mounted under the platform bed by the supplier.

Chassis

The crane shall be designed to be mounted directly behind the cab on a truck chassis with the following minimum specifications:

- Front axle weight rating 16,000 lbs.
- Rear axle weight rating 40,000 lbs.
- Gross vehicle weight rating 56,000 lbs.
- Wheelbase 256 in.
- Cab to axle length 192 in.
- Frame under crane (110,000 PSI steel) 20.0 $in.^3$ section modulus
- Minimum Truck Weight – Front 8,700 lb.
- Minimum Truck Weight – Rear 8,600 lb.
- Conventional cab
- Power steering
- Increased cooling
- Electric engine shutoff (if diesel powered)
- Neutral Safety Switch required for Remote Control
- Diesel Engine Horsepower shall be 400 Net
- Manual Transmission
- Color To be Federal Standard #595B (Colors used in Government Procurement) "Highway Yellow" #13432
- Air Condition
- Dual Air Ride seats both driver and passenger
- Power Windows
- Standard AM / FM Radio

The laden axle weights prior to the crane installation would include the weight of the chassis, platform or body, and counterweight.

The Missouri Department of Transportation Commission reserves the right to waive technicalities and to reject any or all bids and no bid is final until formally accepted by the Commission.