SECTION 14 N

TRUCK DRIVE SYSTEM FOR PCR ROTARY BRIDGE

—GENERAL REQUIREMENTS—

—GENERAL

UNLESS OTHERWISE INDICATED, THE SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION SHALL GOVERN THE WORK. WELDING SHALL BE IN ACCORDANCE WITH SECTION 1.17 OF THESE SPECIFICATIONS. HIGH-STRENGTH BOLTING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS, AS MODIFIED BY THE BONDING AND GROUNDING REQUIREMENTS HEREIN.

DESIGN OF MEMBERS AND CONNECTIONS FOR ANY PORTION OF THE STRUCTURE NOT INDICATED ON THE CONTRACT DRAWINGS SHALL BE COMPLETED BY THE FABRICATOR AND INDICATED ON THE SHOP DRAWINGS.

SUBSTITUTIONS OF SECTIONS OR MODIFICATIONS OF DETAILS, OR BOTH, AND THE REASONS THEREFOR SHALL BE SUBMITTED WITH THE SHOP DRAWINGS FOR APPROVAL. APPROVED SUBSTITUTIONS, MODIFICATIONS, AND NECESSARY CHANGES IN RELATED PORTIONS OF THE WORK SHALL BE COORDINATED BY THE CONTRACTOR WITH THE CONTRACTING OFFICER OR HIS DESIGNATED REPRESENTATIVE.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ERRORS OF DETAILING, FABRICATION, AND FOR THE CORRECT FITTINGS OF THE MEMBERS AND PARTS.

—SCOPE

THIS SECTION COVERS THE FURNISHING OF ALL MATERIAL, LABOR AND PLANT NECESSARY TO FABRICATE, DELIVER, ERECT, SHOP TEST, FIELD TEST AND PLACE IN ACCEPTABLE OPERATION TWO TRUCK WHEEL DRIVE ASSEMBLIES AS SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN BETWEEN THE PAYLOAD CHANGEOUT ROOM STRUCTURAL CONNECTION AND THE TOP OF THE RAILS AT THE SURFACE OF THE LAUNCH PAD.

THE LIMITS OF WORK SHALL BE BETWEEN THE [illegible] CONNECTION TO THE PCR STRUCTURE AND THE TOP OF THE RAILS INCLUDING ALL TRUCK GIRDERS, DOUBLE FLANGED TYPE CRANE WHEELS, AXLES, BEARINGS, DRIVE MOTORS, DRIVE CONTROLS, GEAR REDUCERS, DRIVE SHAFTS, COUPLINGS, BRAKES, EQUALIZING PIN ASSEMBLIES, RAIL SWEEPS AND HURRICANE TIE-DOWN MECHANISMS. IT IS THE INTENT OF THESE SPECIFICATIONS THAT THE COMPLETE TRUCK-WHEEL ASSEMBLIES, INCLUDING DRIVE MOTORS

AND CONTROLS, BE COMPLETELY SHOP-FABRICATED BETWEEN THE HEREINABOVE SPECIFIED LIMITS. MECHANICALLY AND ELECTRICALLY SHOP-TESTED AND SHIPPED TO THE FIELD AND ERECTED IN STRUCTURE IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS PROVIDED TO THE CONTRACTOR'S ERECTION SUPERVISOR.

---REFERENCE SPECIFICATIONS

THE FOLLOWING PUBLICATIONS OF THE ISSUES IN EFFECT ON THE DATE OF ISSUANCE OF INVITATION FOR BIDS FORM A PART OF THIS SPECIFICATION AND, WHERE REFERRED TO HEREAFTER BY BASIC DESIGNATION ONLY, ARE APPLICABLE TO THE EXTENT INDICATED BY THE REFERENCES THERETO. IN THE EVENT OF DIFFERENCE BETWEEN THIS SPECIFICATION OR ITS ACCOMPANYING DRAWINGS AND THE REFERENCED SPECIFICATION, THIS SPECIFICATION AND ITS ACCOMPANYING DRAWINGS SHALL GOVERN TO THE EXTENT OF SUCH DIFFERENCE.

---REFERENCE STANDARDS: ABBREVIATIONS

REFERENCE STANDARDS ARE REFERRED TO HEREINAFTER IN ACCORDANCE WITH THE FOLLOWING ABBREVIATIONS:

AFBMA	ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION
AGMA	AMERICAN GEAR MANUFACTURERS ASSOCIATION
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AISE	ASSOCIATION OF IRON AND STEEL ENGINEERS
AREA	AMERICAN RAILWAY ENGINEERING ASSOCIATION
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWS	AMERICAN WELDING SOCIETY
C.M.A.A.	CRANE MANUFACTURERS ASSOCIATION OF AMERICA, INC. (FORMERLY ELECTRIC OVERHEAD CRANE INSTITUTE, INC.)
FS	FEDERAL SPECIFICATIONS
JIC	JOINT INDUSTRIAL COUNCIL
MIL	MILITARY SPECIFICATIONS
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
SAE	SOCIETY OF AUTOMOTIVE ENGINEERS
SSPC	STEEL STRUCTURES PAINTING COUNCIL
UL	UNDERWRITERS' LABORATORIES, INC.
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE

---DEFINITIONS

CAPACITY-----THE RATED LOAD IN POUNDS, OR TONS OF 2000 POUNDS AVOIRDUPOIS SPECIFIED BY THE MANUFACTURER FOR THE TRUCK ASSEMBLY AND MARKED PLAINLY ON THE TRUCK ASSEMBLY SO AS TO BE CLEARLY LEGIBLE. IN DETERMINING THE RATED LOAD, THREE CONDITIONS SHALL BE INCLUDED: RATED LOAD TRAVELING IN 40 KNOT WIND, RATED LOAD NON-TRAVELING IN 72 KNOT WIND AND RATED LOAD NON-TRAVELING IN HURRICANE WIND.

FPM-----FEET PER MINUTE.

PCR ROTARY BRIDGE SPEED-----THE VELOCITY IN FPM AT WHICH THE MOTOR-DRIVEN TRUCKS WILL CARRY THE RATED LOAD IN HORIZONTAL TRAVEL ALONG THE RAIL RUNWAY.

RATED LOAD-----THE MAXIMUM LOAD FOR WHICH A TRUCK ASSEMBLY IS DESIGNED AND BUILT BY THE MANUFACTURER AND SHOWN ON THE EQUIPMENT NAMEPLATE.

AC-----ALTERNATING CURRENT.

DC-----DIRECT CURRENT.

THE B-10 RATING LIFE OF A GROUP OF APPARENTLY IDENTICAL BALL BEARINGS IS DEFINED AS THE NUMBER OF HOURS AT SOME GIVEN CONSTANT SPEED THAT 90 PERCENT OF A GROUP OF BEARINGS WILL COMPLETE OR EXCEED BEFORE THE FIRST EVIDENCE OF FATIGUE DEVELOPS.

---DEFINITION OF AWS CODE

AWS CODE SHALL MEAN AMERICAN WELDING SOCIETY "STRUCTURAL WELDING CODE", AWS D1.1-72 WITH THE FOLLOWING MODIFICATION:

DELETE AWS PARAGRAPH 1.1.2 AND SUBSTITUTE: ALL REFERENCES TO THE NEED FOR APPROVAL SHALL MEAN "APPROVAL BY THE CONTRACTING OFFICER", AND ALL REFERENCES TO THE "BUILDING COMMISSIONER" SHALL MEAN THE "CONTRACTING OFFICER".

---QUALIFICATIONS FOR WELDING WORK

WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH THE "STANDARD QUALIFICATION PROCEDURE" OF THE AMERICAN WELDING SOCIETY. THE CONTRACTING OFFICER RESERVES THE RIGHT TO REQUIRE THAT TEST SPECIMENS BE MADE IN THE PRESENCE OF AN AUTHORIZED REPRESENTATIVE OF THE GOVERNMENT, AND THAT SUCH TEST SPECIMENS BE TESTED BY AN APPROVED TESTING LABORATORY.

ALL WELDING OPERATIONS SHALL BE QUALIFIED UNDER THE PROVISIONS OF THE "STANDARD QUALIFICATION PROCEDURE" OF THE AMERICAN WELDING SOCIETY, OR UNDER AN EQUIVALENT QUALIFICATION TEST APPROVED IN ADVANCE BY THE CONTRACTING OFFICER. IN ADDITION TO THE ABOVE REQUIREMENTS, ALL TESTS SHALL BE PERFORMED ON TEST PIECES IN POSITIONS AND WITH CLEARANCES EQUIVALENT TO THOSE ACTUALLY ENCOUNTERED IN CONSTRUCTION. IF A TEST WELD FAILS TO MEET REQUIREMENTS, AN IMMEDIATE RETEST OF TWO TEST WELDS SHALL BE MADE, AND EACH TEST WELD SHALL PASS. FAILURE IN THE IMMEDIATE RETEST WILL REQUIRE THAT THE WELDER BE RETESTED AFTER FURTHER PRACTICE OR TRAINING, AND A COMPLETE SET OF TEST WELDS SHALL BE MADE.

FOR WELDING TO BE PERFORMED AT OTHER THAN THE PROJECT SITE, THE CONTRACTING OFFICER MAY, AT HIS OPTION, ACCEPT CERTIFICATION FROM AN APPROVED TESTING AGENCY THAT EACH OPERATOR HAS SATISFACTORILY PERFORMED THE REQUIRED TESTS AND HAS BEEN ENGAGED IN THE PROCESS OF WELDING WITHIN A PERIOD OF 3 MONTHS PRIOR TO THE CONTRACT DATE. OPERATORS SHALL BE PERMITTED TO MAKE ONLY THOSE TYPES OF WELDMENTS FOR WHICH EACH IS SPECIFICALLY QUALIFIED.

---PROOFS OF COMPLIANCE

SUBMIT PROOFS OF COMPLIANCE AS SPECIFIED IN THE "CONTRACT SCHEDULE" AND AS FOLLOWS:

CERTIFICATE OF CONFORMANCE THAT TRUCK ASSEMBLIES, COMPONENTS, AND CONTROLS COMPLY WITH THE REQUIREMENTS SPECIFIED HEREIN.

CERTIFICATE OF CONFORMANCE THAT THE TRUCK ASSEMBLIES, COMPONENTS, AND CONTROLS HAVE BEEN FACTORY TESTED FOR THE TESTS SPECIFIED IN THE ARTICLE ENTITLED "FACTORY TESTS BEFORE SHIPMENT."

CERTIFICATE OF CONFORMANCE THAT ELECTRIC MOTORS, WIRING, CONTACT CONDUCTORS, CONTROLS, OVERCURRENT PROTECTION AND GROUNDING SHALL CONFORM TO NEC, NFPA 70-1971 AND TO UL STANDARDS. THE LABEL OR LISTING WITH RE-EXAMINATION OF THE UL WILL BE ACCEPTED AS EVIDENCE THAT THE MATERIALS CONFORM TO THIS REQUIREMENT AND TO NEC.

MANUFACTURER'S WARRANTY.

REPORT OF MECHANICAL TESTS, AS SPECIFIED IN THE REFERENCE SPECIFICATION FOR THE MATERIAL AND ASTM A370-72, FOR HIGH-STRENGTH BOLTS.

REPORTS OF CHEMICAL COMPOSITION, AND MECHANICAL, USABILITY AND SOUNDNESS TESTS, AS SPECIFIED IN THE PARTICULAR REFERENCE SPECIFICATION FOR THE MATERIAL, FOR ELECTRODES FOR MANUAL SHIELDED METAL-ARC WELDING, AND ELECTRODES AND FLUX FOR SUBMERGED-ARC WELDING.

---STANDARD PRODUCT

THE TRUCKS AND COMPONENTS, ELECTRIFICATION SYSTEM COMPONENTS, PARTS, ATTACHMENTS AND ACCESSORIES SHALL BE OF SIZE, DESIGN AND QUALITY AS REQUIRED TO MEET REQUIREMENTS SPECIFIED HEREIN AND SHALL BE THE STANDARD FABRICATED PRODUCTS OF THE MANUFACTURER OF HIS SUPPLIER, SO THAT PROMPT AND CONTINUING SERVICE AND THE DELIVERY OF REPAIR PARTS AND REPLACEMENT COMPONENTS MAY BE ASSURED. ALL PARTS, ASSEMBLIES AND COMPONENTS SHALL BE NEW AND UNUSED.

---PREPRODUCTION DESIGN DATA

SUBMIT CONSTRUCTION DRAWINGS AND SUPPORTING DESIGN DATA BEFORE FABRICATION, OF EACH TRUCK ASSEMBLY, AS SPECIFIED IN THE "CONTRACT SCHEDULE" AND AS FOLLOWS:

DESIGN CALCULATIONS AND LOADS, WHEEL CLASSIFICATION, STRESSES, TORQUES, GEAR RATIOS, SPEEDS, WHEEL LOADS AND FACTOR OF SAFETY.

STRUCTURAL STEEL CHARACTERISTICS, DEFLECTIONS FOR GIRDERS, TRUCK BEAMS, INTERLOCKS; TRUCK ELECTRIFICATION, MOTOR AND ELECTRICAL DESIGN DATA.

B-10 "RATING LIFE", IN NUMBER OF HOURS, FOR ALL ANTI-FRICTION BEARINGS USED IN MOTORS, DRIVES, GEAR ASSEMBLIES, AND WHEELS.

MANUFACTURER'S PRINTED SPECIFICATIONS, DRAWINGS AND DESCRIPTIVE DATA FOR THE PROPOSED UNITS.

PROVIDE SUFFICIENT INFORMATION SO THAT TRUCK ASSEMBLIES AND COMPONENTS MAY BE CONSIDERED FOR APPROVAL WITHOUT REFERENCE TO DETAIL DRAWINGS.

---SHOP DRAWINGS AND DESCRIPTIVE DATA

SUBMIT SHOP DRAWINGS AND DESCRIPTIVE DATA AS SPECIFIED IN THE "CONTRACT SCHEDULE" AND AS FOLLOWS:

GENERAL ARRANGEMENT DRAWINGS SHALL SHOW LOCATION, PLAN, RAIL LAYOUT, SPAN CAPACITIES, DUTY CLASS, SPEEDS, SECTIONS AND DETAILS OF ALL OF THE MAIN FEATURES OF THE TRUCK ASSEMBLIES AND HURRICANE TIE-DOWN MECHANISMS, AND SHALL INCLUDE CLEARANCES, SPEEDS, LOADS, MAXIMUM WHEEL LOADS AND OTHER SIMULTANEOUS WHEEL LOADS, WITHOUT IMPACT AND WEIGHT BREAKDOWN.

WEIGHTS, AS APPLICABLE, SHALL BE SHOWN FOR RAILS ONLY; TRUCKS COMPLETE WITH WHEELS, AXLES, AND GEARS; DRIVING MACHINERY; AND TOTAL NET WEIGHT OF THE ASSEMBLY. EACH ASSEMBLED INTEGRAL TRUCK ASSEMBLY SHALL BE SHOWN IN PLAN, ELEVATION, AND END VIEW.

SPECIFIC ARRANGEMENT DRAWINGS OF THE TRUCK DRIVE, AND MACHINERY SHALL BE SHOWN IN PLAN SECTION, AND ELEVATION, AS APPLICABLE: GEARS, REDUCERS, SHAFTS, BEARINGS, COUPLINGS, WHEELS AND FRAMING. IN ELEVATION, THESE DRAWINGS SHALL SHOW, AS APPLICABLE, CONTROLLING DIMENSIONS, THE LOAD CARRYING RANGES AND SPEEDS FOR ALL LOAD CARRYING PARTS, AND A DESCRIPTION OF MOTORS, CONTROLLERS, LIMIT SWITCHES, COUPLINGS, BRAKES, BEARINGS, AND SIMILAR PARTS, WITH A PARTS LIST. THE DESCRIPTION SHALL INCLUDE, AS APPLICABLE, TUBE AND HORSEPOWER RATINGS, REVOLUTIONS PER MINUTE, SERVICE FACTORS, TEMPERATURE, TORQUE, CURRENT CHARACTERISTICS AND MANUFACTURER'S MODEL DESIGNATIONS. DETAILS SHALL BE PROVIDED AS REQUIRED TO SHOW DIMENSIONS WITH TOLERANCES AT TRACK RAILS, SUPPORTS, AND GIRDERS; SURFACE FINISHES, HARDENED MATERIAL SPECIFICATION DESIGNATIONS, AND WELDING SYMBOLS. WELDING SYMBOLS AND INSTRUCTIONS FOR THEIR USE SHALL BE IN ACCORDANCE WITH AWS D1.1-72.

ELECTRICAL DRAWINGS SHALL INDICATE THE COMPLETE ELECTRIFICATION SYSTEM, INCLUDING: A GENERAL DRAWING OF THE ELECTRICAL EQUIPMENT, WIRING, AND CONDUIT, SHOWING AND IDENTIFYING ALL ELECTRICAL EQUIPMENT, MANUFACTURER'S NAME, MODEL NUMBERS, RATINGS, OHMIC VALUES OF RESISTOR SEGMENTS, WIRE TYPES AND SIZES, AND CONDUIT TYPES AND SIZES, AND DIAGRAMS SHOWING ALL CONNECTIONS INCLUDING MANUFACTURER'S PANEL WIRING DIAGRAMS WITH SCHEMATICS AND INTERCONNECTION OF PANELS, SPEED/LOAD CURVES OF CONTROLLERS FOR D.C. MOTORS, AND MOTOR SPEED/MOTOR-TORQUE CURVES FOR CONTROLLERS FOR TRUCK TRAVEL, ALL CARRIED TO 200 PERCENT OF THE FULL RATED LOAD.

PROVIDE MANUFACTURER'S PRINTED INSTRUCTIONS FOR INSTALLATION, LUBRICATION, OPERATION, MAINTENANCE, ADJUSTMENT AND REPAIR AS REQUIRED BY THE "CONTRACT SCHEDULE." REPAIR SECTION SHALL CONTAIN REPLACEMENT PART NUMBERS FOR ENTIRE ASSEMBLY.

---DELIVERY, UNLOADING AND STORAGE

DELIVER TRUCKS, TRUCK COMPONENTS AND ACCESSORIES TO THE PROJECT SITE AND UNLOAD WHERE DIRECTED.

STORE TRUCK ASSEMBLIES ABOVE GROUND, ON PLATFORMS, SKIDS OR OTHER SUPPORTS, AND PROTECT COMPLETELY FROM WEATHER.

TRUCK COMPONENTS, ELECTRIFICATION SYSTEM COMPONENTS AND TRUCK FITTINGS AND ACCESSORIES SHALL BE PACKED IN A MANNER TO INSURE CARRIER ACCEPTANCE AND SAFE DELIVERY AT DESTINATION. CONTAINERS SHALL BE IN ACCORDANCE WITH CONSOLIDATED FREIGHT CLASSIFICATION RULES OR OTHER CARRIER REGULATION AS APPLICABLE TO MODE OF TRANSPORTATION. STORE UNITS IN THE ORIGINAL, UNBROKEN CONTAINERS IN A DRY, WEATHERTIGHT AND VENTILATED STRUCTURE.

ALL MATERIALS SHALL BE KEPT FROM DIRT AND OTHER FOREIGN MATTER AND PROTECTED FROM MOISTURE AND CORROSION.

---PERFORMANCE REQUIREMENTS---

--DESIGN SAFETY FACTOR

UNLESS OTHERWISE SPECIFIED HEREIN, ALLOWABLE STRUCTURAL DESIGN STRESSES FOR ALL MEMBERS OF THE TRUCK ASSEMBLIES SHALL BE BASED ON A SAFETY FACTOR OF 4, BASED ON THE ULTIMATE STRENGTH OF THE MATERIAL USED. NOT LESS THAN 4 (1)

--DESIGN LOADS

DESIGN LOADS FOR DEAD LOAD, HORIZONTAL TRAVEL LOADS INDUCED BY ROTARY BRIDGE TRAVEL AND IMPACT LOAD SHALL CONFORM TO AISE STANDARD NO. 6.

WIND LOAD IMPOSED UPON TRUCK ASSEMBLIES SHALL BE NOT LESS THAN STATED ON THE DRAWINGS.

--ALLOWABLE DEFLECTION

TRUCK ASSEMBLY DEFLECTION SHALL BE SUCH THAT THE WHEEL RUNNING SURFACES WILL NOT DEVIATE, ABOVE OR BELOW, FROM A LEVEL LINE CONNECTING THE TOPS OF THE ENDS OF THE SURFACES, MORE THAN THAT ALLOWED IN THE FOLLOWING TABLE, UNDER ANY COMBINATION OF LOADS AND WITH NO IMPACT INCLUDED:

MAXIMUM ALLOWABLE DEVIATION, INCLUDING DEFLECTION OF TRUCK GIRDER, INCH PER INCHES OF SPAN = 1 IN 600.

--OPERATIONAL REQUIREMENTS

PERFORMANCE RESPONSE TO CONTROLS SHALL BE INSTANTANEOUS, EXCEPT WHERE TIME DELAY DEVICES AND RELAYS ARE PROVIDED. OPERATION SHALL BE SMOOTH AND QUIET. HEAT RISE IN MOTORS, BRAKES, AND

AND TRANSISTORS DURING MAXIMUM TO MINIMUM CAPACITY OPERATION SHALL NOT EXCEED THE DESIGN LIMITATION. TRUCK DRIVE SYSTEM SHALL BE CAPABLE OF CONTINUOUS MAXIMUM LOAD AND SPEED OPERATION WITHOUT ELECTRICAL BREAKDOWN, OR OVERHEATING OF MOTORS, RESISTORS, OR BRAKE FOR A CONTINUOUS PERIOD OF NOT LESS THAN 2.5 HOURS. TRUCK DRIVE ASSEMBLIES SHALL BE CAPABLE OF CONTINUOUS OPERATION AT ANY SPEED BETWEEN A MINIMUM OF 1/8 INCH PER SECOND AND A MAXIMUM OF 4.8 INCHES PER SECOND.

SAFETY DEVICES AND BRAKES SHALL BE POSITIVE IN ACTION, WITHOUT SLIPPING, CHATTERING, OR JAMMING, AND SHALL HAVE A FAIL-SAFE DESIGN.

—BEARINGS AND BEARING LIFE

ALL BEARINGS, EXCEPT THOSE SUBJECT ONLY TO SMALL ROCKER MOTION, SHALL BE OF THE PRECISION ANTI-FRICTION TYPE CONFORMING TO FS FF-B-171A(1), GRADE 00 FOR BALL BEARINGS AND TO FS-FF-B-185(2) FOR ROLLER BEARINGS.

ALL BEARINGS SUBJECT TO THRUST FROM DEFLECTION OF BEARING SUPPORTS, AND BEARINGS FOR HERRINGBONE AND DOUBLE HELICAL GEAR SETS, SHALL INCLUDE ONE FIXED AND ONE FLOATING BEARING.

HOUSINGS (INCLUDING PILLOW BLOCKS) SHALL BE DUSTTIGHT, OF CAST STEEL AND SECURED BY NOT LESS THAN FOUR BOLTS. WHEN PRACTICABLE, HOUSINGS SHALL BE SPLIT. SPLIT BEARING HOUSINGS SHALL BE FASTENED TOGETHER WITH NOT LESS THAN FOUR BOLTS. ONE PIECE HOUSINGS SHALL BE DESIGNED AND LOCATED TO FACILITATE SHAFT AND BEARING REMOVAL.

BEARINGS SHALL BE SHIELDED, SEALED AND LUBRICATED AS SPECIFIED FOR THE APPLICATION. BEARINGS IN EXPOSED APPLICATIONS AND BEARINGS LUBRICATED WITH AN OIL BATH SHALL BE SEALED TO PREVENT LEAKAGE.

ANTI-FRICTION BEARINGS, SHALL BE DESIGNED FOR DEAD LOAD, DIRECT REACTIONS OF LOAD APPLIED AS A DEAD LOAD) AND TORQUE REACTIONS. ANTI-FRICTION BEARINGS SHALL BE DESIGNED FOR THE SPEEDS RESULTING FROM OPERATION OF THE DRIVING MOTOR AT ITS 30-MINUTE RATED SPEED. THE PERCENTAGE OF DEAD LOAD AND THE APPLICABLE B-10 AFBMA "BEARING LIFE" OF BEARINGS, IN HOURS, AS APPLICABLE TO THE DUTY CLASS, SHALL BE AS FOLLOWS:

RATING LIFE *	PERCENT LOAD
15,000	85

* THE B-10 "RATING LIFE" OF A GROUP OF APPARENTLY IDENTICAL BALL BEARINGS IS DEFINED AS THE NUMBER OF REVOLUTIONS (OR HOURS AT SOME GIVEN CONSTANT SPEED) THAT 90 PERCENT OF A GROUP OF BEARINGS WILL COMPLETE OR EXCEED BEFORE THE FIRST EVIDENCE OF FATIGUE DEVELOPS.

AND TRANSISTORS DURING MAXIMUM TO MINIMUM CAPACITY OPERATION SHALL NOT EXCEED THE DESIGN LIMITATION. TRUCK DRIVE SYSTEM SHALL BE CAPABLE OF CONTINUOUS MAXIMUM LOAD AND SPEED OPERATION WITHOUT ELECTRICAL BREAKDOWN, OR OVERHEATING OF MOTORS, RESISTORS, OR BRAKES FOR A CONTINUOUS PERIOD OF NOT LESS THAN 2.5 HOURS. TRUCK DRIVE ASSEMBLIES SHALL BE CAPABLE OF CONTINUOUS OPERATION AT ANY SPEED BETWEEN A MINIMUM OF 1/8 INCH PER SECOND AND A MAXIMUM OF ~~4~~ 4.0 INCHES PER SECOND. (E)

SAFETY DEVICES AND BRAKES SHALL BE POSITIVE IN ACTION, WITHOUT SLIPPING, CHATTERING, OR JAMMING, AND SHALL HAVE A FAIL-SAFE DESIGN.

---BEARINGS AND BEARING LIFE

ALL BEARINGS, EXCEPT THOSE SUBJECT ONLY TO SMALL ROCKER MOTION, SHALL BE OF THE PRECISION ANTI-FRICTION TYPE CONFORMING TO FS FF-B-171A(1), GRADE 00. FOR BALL BEARINGS AND TO FS-FF-B-185(4) FOR ROLLER BEARINGS.

ALL BEARINGS SUBJECT TO THRUST FROM DEFLECTION OF BEARING SUPPORTS, AND BEARINGS FOR HERRINGBONE AND DOUBLE HELICAL GEAR SETS, SHALL INCLUDE ONE FIXED AND ONE FLOATING BEARING.

HOUSINGS (INCLUDING PILLOW BLOCKS) SHALL BE DUSTTIGHT, OF CAST STEEL AND SECURED BY NOT LESS THAN FOUR BOLTS. WHEN PRACTICABLE, HOUSINGS SHALL BE SPLIT. SPLIT BEARING HOUSINGS SHALL BE FASTENED TOGETHER WITH NOT LESS THAN FOUR BOLTS. ONE PIECE HOUSINGS SHALL BE DESIGNED AND LOCATED TO FACILITATE SHAFT AND BEARING REMOVAL.

BEARINGS SHALL BE SHIELDED, SEALED AND LUBRICATED AS SPECIFIED FOR THE APPLICATION. BEARINGS IN EXPOSED APPLICATIONS AND BEARINGS LUBRICTAED WITH AN OIL-BATH SHALL BE SEALED TO PREVENT LEAKAGE.

ANTI-FRICTION BEARINGS, SHALL BE DESIGNED FOR DEAD LOAD, DIRECT REACTIONS OF LOAD (APPLIED AS A DEAD LOAD) AND TORQUE REACTIONS. ANTI-FRICTION BEARINGS SHALL BE DESIGNED FOR THE SPEEDS RESULTING FROM OPERATION OF THE DRIVING MOTOR AT ITS 30-MINUTE RATED SPEED. THE PERCENTAGE OF DEAD LOAD AND THE APPLICABLE B-10 AFBMA "RATING LIFE" OF BEARINGS, IN HOURS, AS APPLICABLE TO THE DUTY CLASS, SHALL BE AS FOLLOWS:

RATING LIFE *	PERCENT LOAD
15,000	85

* THE B-10 "RATING LIFE" OF A GROUP OF APPARENTLY IDENTICAL BALL BEARINGS IS DEFINED AS THE NUMBER OF REVOLUTIONS (OR HOURS AT SOME GIVEN CONSTANT SPEED) THAT 90 PERCENT OF A GROUP OF BEARINGS WILL COMPLETE OR EXCEED BEFORE THE FIRST EVIDENCE OF FATIGUE DEVELOPS.

IGN AND FABRICATION

RUCK ASSEMBLY SHALL BE DESIGNED AND FABRICATED IN ACCORDANCE WITH AISC "SPECIFICATIONS FOR THE ESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS", ADOPTED FEBRUARY 12, 1969, NCLUDING "SUPPLEMENT NO. 1 TO AISC SPECIFICATION", "SUPPLEMENT NO. 2 TO AISC SPECIFICATION", ND "COMMENTARY ON THE AISC SPECIFICATION", AND ECCI NO. 61, PARAGRAPH "S.

IGH STRENGTH BOLT FASTENERS SHALL BE INSTALLED IN ACCORDANCE WITH AISC "SPECIFICATION FOR TRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS" APRIL 18, 1972.

RUCK ASSEMBLY SHALL BE ALL-WELDED CONSTRUCTION, EXCEPT FOR REMOVABLE SUBASSEMBLIES AND GIRDER PLICES REQUIRED TO MAINTAIN SHOP ALIGNMENT AND FOR SHIPMENT. REMOVABLE SUBASSEMBLIES AND EAM SPLICES SHALL BE FASTENED WITH HIGH STRENGTH BOLTED FASTENERS. SPLICES FOR GIRDERS SHALL BE ADE BY MEANS OF CONTINUOUS, COMPLETE PENETRATION BUTT WELDS.

CK DRIVES

ECHANICAL DESIGN OF TRUCK DRIVE, SHAFTS, AXLES, GEARS AND GEARING, BEARINGS, WHEELS, COUPLINGS, RAKES AND BUMPERS AND STOPS SHALL CONFORM TO THE REQUIREMENTS OF AISE STANDARD NO. 6 AND 3 TO HE REQUIREMENTS SPECIFIED HEREIN.

CKS

RUCKS SHALL BE OF THE ARTICULATED TYPE AND SHALL BE CONNECTED TO THE ROTARY BRIDGE TUBULAR FRAME Y WELDING AS SHOWN ON THE DRAWINGS.

ACH TRUCK ASSEMBLY SHALL HAVE NOT LESS THAN 8 WHEELS. SUFFICIENT WHEELS SHALL BE PROVIDED TO ROPERLY DISTRIBUTE THE LOAD ON THE TRACK RAILS. STATIC WHEEL LOADING IN POUNDS, FOR CYLINDRICAL EADS, SHALL BE DETERMINED AS FOLLOWS: $P = SC^2 WD \div 10.2 \times 10^6$ WHERE P = ALLOWABLE LOADING POUNDS. C = ALLOWABLE STRESS, PSI. W = RAIL WIDTH AT TOP MINUS CORNER RADII, IN., D = TREAD DIAMETER INCHES.

(CASE HARDENED (60 TO 63 R_C) ⚠3

HEELS SHALL BE FLANGED TYPE, MANUFACTURED FROM FORGED CONTINUOUSLY HEAT TREATED ALLOY STEEL ITH MACHINED, HARDENED TREADS AND FLANGES, HARDENED TO LESS THAN 5/16-INCH DEEP. WHEELS SHALL E DESIGNED TO OPERATE ON CURVED 175 POUND CRANE RAILS. THE RUNNING SURFACE OF THE RAIL SHALL E HEAT TREATED TO 302-375 BRINELL. CONTACT STRESS FOR WHEELS SHALL BE IN ACCORDANCE WITH AISE STD NO.6.

HEELS SHALL BE CARRIED ON SEALED, SELF-ALIGNING, LUBRICATED ANTI-FRICTION BEARINGS DESIGNED FOR XIAL AND THRUST LOADING. BEARINGS SHALL BE PROVIDED WITH FITTINGS FOR PRESSURE LUBRICATION.

WHEEL GEAR TEETH SHALL NOT TOUCH RAIL BEAMS. WHEELS SHALL BE READILY REMOVABLE ANYWHERE ALONG THE RAIL BEAMS. PROVISION SHALL BE MADE FOR EQUAL SHIMMING OF WHEELS ON BOTH SIDES OF THE RUNWAY RAILS.

AS MODIFIED BELOW FOR BIR BUSINESS 36 △b

WHEELS SHALL BE WROUGHT-STEEL CONFORMING TO ASTM DESIGNATION A 504, CLASS C-1, AND SHALL BE 36 INCH TREAD DIAMETER, DOUBLE FLANGED, FLAT FACED, CRANE TYPE, WITH EXTRA HEAVY FLANGES. THE SLOPE OF THE FLANGE TOWARD THE TREAD SHALL BE NOT LESS THAN 12 DEGREES AND THE THROAT RADIUS SHALL NOT EXCEED 3/8 INCH.

CASE HARDENED (60 TO 63 R_C) TO PROVIDE FOR AN ALLOWABLE LOAD CAPACITY OF 165,000 LBS. FOR A 36 INCH DIAMETER WHEEL ON A 175 LB. PER YARD RAIL SECTION.

THE WHEELS SHALL BE HEAT TREATED TO PROVIDE A THROUGH-HARDENED TREAD AND FLANGE WITH A HARDNESS CONFORMING TO ASTM A504, [illegible] CLASS C. △b △c

THE WHEELS SHALL BE MOUNTED SECURELY ON THE AXLES AT THE GAGE OF 3 FEET 0 INCHES CENTER TO CENTER, WITH AN OVERALL TOLERANCE OF PLUS OR MINUS 0.030 INCH. THE GAGE OF THE WHEELS SHALL BE CHECKED USING A GAGE CONSTRUCTED SPECIALLY FOR THE PURPOSE AND DESIGNED TO PERMIT ACCURATE DETERMINATION OF THE TRUE GAGE OF THE WHEELS. A CORRESPONDING 3-POINT, RAILROAD TYPE TRACK GAGE SHALL BE CONSTRUCTED. THE TRACK GAGE SHALL BE DESIGNED TO PERMIT SETTING THE RAILS TO A GAGE OF 3 FEET 0 INCH WITH A TOLERANCE OF PLUS OR MINUS 1/16 INCH. THE WHEEL AND RAIL GAGES SHALL BE CAREFULLY COMPARED TO INSURE THAT THE ACTUAL TOTAL OPERATING CLEARANCE BETWEEN WHEEL FLANGES AND RAIL HEADS WILL NOT BE LESS THAN 0.125 INCH OR MORE THAN 0.375 INCH. THE CONTRACTOR SHALL FULLY COORDINATE THE GAGE AND RAILS AND SHALL INSURE THAT THE GAGES ARE CONSTRUCTED TO THE DISTANCES AT THE GAGE LINE LOCATED AS SHOWN ON THE DRAWINGS. ALL WHEELS SHALL BE THE SAME DIAMETER TO A TOLERANCE OF PLUS OR MINUS 0.005 INCH. WHEELS SHALL BE SELECTED FROM WHEELS MACHINED TO WITHIN THE ABOVE TOLERANCES AND SHALL BE MATCHED IN SETS OF 8 WHEELS EACH SUCH THAT THE MAXIMUM DIFFERENCE IN ROLLING CIRCUMFERENCE IS THE MINIMUM POSSIBLE WITHIN THE TOLERANCE SPECIFIED. IN ADDITION, EACH OF THE SETS OF WHEELS SHALL HAVE AVERAGE ROLLING CIRCUMFERENCES AS NEARLY IDENTICAL AS POSSIBLE. 0.030 CC 22

WHEELS SHALL BE ROLLER BEARING MOUNTED ON FIXED AXLES.

NO CHANGE IN AXLE DIAMETER FOR BEARING SEAT, OR OTHER PURPOSES SHALL BE MACHINED WITHOUT PROVIDING AN ADEQUATE FILLET AT THE BASE OF THE SHOULDER TO PREVENT STRESS CONCENTRATIONS. FILLETS SHALL NOT BE LESS THAN 1/4 INCH EXCEPT WHERE BEARING SEATS REQUIRE A SMALLER RADIUS.

ADEQUATE PROVISION SHALL BE MADE TO HOLD BEARINGS ACCURATELY IN POSITION WITH SHIM ALLOWANCES FOR ADJUSTMENT OF WHEEL GAGE.

ALL BEARINGS SHALL BE SECURELY LOCKED IN POSITION AND, WHERE RECOMMENDED BY THE BEARING MANUFACTURER, SHALL BE PRELOADED IN ACCORDANCE WITH HIS INSTRUCTIONS.

WHEEL BEARINGS SHALL BE HIGH CAPACITY TAPERED ROLLER BEARINGS AND SHALL BE SELECTED ON THE BASIS OF RATINGS AS DETERMINED IN ACCORDANCE WITH ASA B6.11.

RATED FOR 200 % OF RATED LOAD (100 % OVERLOAD)= LOAD STARTING OR STALLED= -3

ALL WORM GEAR REDUCERS SHALL BE SELECTED TO HANDLE THE TORQUE IMPOSED BY THE STALLED LOAD TORQUE CAPABILITY OF THE MOTOR BASED ON AGMA CLASS I RATINGS (CONTINUOUS) AND SHALL BE FURTHER CHECKED TO INSURE ADEQUATE STATIC CAPACITY TO RESIST THE MAXIMUM TORQUE OF LOADS IMPOSED BY THE PARKING BRAKE WITH A FACTOR OF SAFETY OF NOT LESS THAN 1.5 BASED ON THE YIELD STRENGTH OF THE MATERIALS. WORM GEAR REDUCERS SHALL BE COMPLETELY REVERSIBLE (I.E. THE WORM WHEEL SHALL BE CAPABLE OF DRIVING THE WORM SHAFT UNDER CONDITIONS OF REVERSAL OF TORQUE). WORM GEAR CASES SHALL BE COMPLETELY WEATHERPROOF, AND SHALL BE EQUIPPED WITH OIL LEVEL AND DRAIN PLUGS AND WEATHERPROOF, FILTER-TYPE BREATHERS. EACH REDUCER SHALL BE PROVIDED WITH A PERMANENTLY ATTACHED NAMEPLATE CONTAINING THE FOLLOWING INFORMATION: THE NAME OF THE MANUFACTURER, THE REDUCTION RATIO, THE RATED CAPACITY, THE RATED SPEED, AND THE SERVICE RATING OR SERVICE CLASS.

ALL SPUR GEARING SHALL HAVE ACCURATELY CUT TEETH. GEAR CASES SHALL BE OIL-TIGHT AND SHALL BE EQUIPPED WITH OIL DRAIN PLUGS, OIL LEVEL PLUGS, WEATHERPROOF FILTER TYPE BREATHERS, AND GASKETED INSPECTION COVERS. GASKET MATERIAL SHALL BE OIL AND GREASE RESISTANT. GEAR TEETH SHALL BE RATED FOR 200 % OF RATED LOAD (100 % OVERLOAD) FOR STARTING OR STALLED LOAD TORQUES DEVELOPED BY THE DRIVE MOTOR. -3

DRIVE SHAFTS AND COUPLINGS

FLEXIBLE COUPLINGS SHALL BE OF SUFFICIENT CAPACITY TO DEVELOP THE FULL STRENGTH OF THE SHAFTING WHICH THEY CONNECT AND SHALL BE PRESSED AND KEYED THEREON. IN DETERMINING THE COUPLING CAPACITY, THE MANUFACTURER'S PUBLISHED RATING SHALL BE DIVIDED BY A SERVICE FACTOR OF 1-1/2. COUPLINGS SHALL BE OF FORGED STEEL AND SHALL TRANSMIT TORQUE BY MEANS OF A STEEL GRID SPRING FITTED INTO GROOVES IN THE PERIPHERY OF THE COUPLING HUBS, BY MEANS OF EXTERNAL GEARS ON HUBS ENGAGING IN INTERNAL GEARS ON THE COUPLING SHEAVES, OR BY MEANS OF FLEXIBLE ANNULAR STEEL DISCS BOLTED ALTERNATELY TO THE END FLANGES AND CENTER MEMBER BY BODY BOUND BOLTS. COUPLINGS OF THE GRID OR GEARED TYPE SHALL BE INCLOSED AND SEALED TO RETAIN THE LUBRICANT AND SHALL BE OIL TIGHT UNDER BOTH STATIC AND OPERATING CONDITIONS.

SHAFTING MAY BE COLD FINISHED STEEL OR SUITABLY HEAT TREATED AND TEMPERED ALLOY STEEL. SHAFTING OF NONUNIFORM DIAMETER SHALL BE TURNED WITH NOT LESS THAN 1/4 INCH RADIUS FILLETS WHERE CHANGES OF SECTION OCCUR.

HURRICANE TIE-DOWN MECHANISM

THE HURRICANE TIE-DOWN CONSISTS OF FOUR TAPERED ANCHOR PINS PER TRUCK ASSEMBLY, AS SHOWN ON THE DRAWINGS. ANCHOR PINS SHALL BE OF FORGED AISI 4340 STEEL WITH A MINIMUM YIELD POINT OF 140 KIPS, AND ULTIMATE STRENGTH OF 150 KIPS PER SQUARE INCH AND A MINIMUM BRINELL HARDNESS OF 310.

SPHERICAL CONNECTION ASSEMBLY AT TOP OF TRUCKS

SPHERICAL CONNECTION ASSEMBLY INTERFACE BETWEEN TOP OF TRUCKS AND PCR STRUCTURE WILL BE INSTALLED BY THE CONTRACTOR IN ACCORDANCE WITH THE DRAWINGS AND INCLUDES THE FOLLOWING COMPONENTS: CONTRACTOR SHALL ERECT IN PLACE, BOLT TO TRUCK SYSTEM AND WELD TO MOBILE LAUNCHER STRUCTURE. ⚠8

PART	DESCRIPTION	MATERIAL	NUMBER FURNISHED BY GOVERNMENT PER TRUCK	TOTAL
7 & 8	BASE PLATE INTERFACE WITH TRUCK BEAM	[illegible]	1	2
6	SPHERICAL YOKE	[illegible]	COMPRISING ONE COMPLETE ASSEMBLY 1	TWO COMPLETE ASSEMBLIES FURNISHED BY THE GOVERNMENT 2
5	SPHERICAL BEARING	[illegible]	ONE ASSEMBLY REQUIRED PER TRUCK ASSEMBLY 1	2
3 & 4	BOLT COLLAR & BOLTS	[illegible]	1	2
1 & 2	ADJUSTABLE END INTERFACE WITH PCR STRUCTURE	[illegible]	1	2
9, 10, 11, 12	BOLTS FOR BOLT COLLAR, BASE PLATE LOCK SCREWS & LUB. FITTINGS	[illegible] GRADE B	32	64

NONDESTRUCTIVE TESTING

FORGINGS SHALL, IN ADDITION TO THE TEST REQUIREMENTS OF THEIR RESPECTIVE ASTM SPECIFICATIONS, BE 100 PERCENT INSPECTED BY ULTRASONIC INSPECTION, PRIOR TO MACHINING. THIS INSPECTION SHALL BE PERFORMED BY OR UNDER THE DIRECTION OF A RECOGNIZED INDEPENDENT TESTING LABORATORY APPROVED BY THE GOVERNMENT. THE CONTRACTOR SHALL SUBMIT FOR REVIEW BY THE GOVERNMENT THE NAMES AND QUALIFICATIONS OF ANY PARTICULAR INSPECTION AGENCIES WHICH HE DESIRES TO BE CONSIDERED. THE CONTRACTOR SHALL AFFORD SUCH INSPECTION AGENCY COMPLETE

COOPERATION, ACCESS TO THE WORK, AND THE NECESSARY USE OF FACILITIES AS REQUIRED FOR THE SATISFACTORY PROGRESS OF THE INSPECTION. THE INSPECTION SHALL BE A BASIS FOR ACCEPTANCE OR REJECTION OF THE REFERENCED MATERIALS SUBJECT TO THE FOLLOWING CONDITIONS.

THE INDEPENDENT INSPECTION AGENCY SHALL SUBMIT FOR REVIEW AND COMMENT BY THE CONTRACTOR, AND APPROVAL BY THE CONTRACTING OFFICER, THE DETAILS TO BE FOLLOWED FOR THE INSPECTION AND REPORT, IN ACCORDANCE WITH ASTM A388 INCLUDING, BUT NOT LIMITED TO:

METHOD TO BE USED (REFLECTION OR RESISTANCE,OR BOTH), AND THE DIRECTION AND ANGULARITY TO INSURE PICKING UP ALL DISCONTINUITIES PRESENT.

TIME OF TEST

DEGREE OF SURFACE PREPARATION

COUPLANTS

FREQUENCY

METHOD OF SCANNING TO INSURE 100 PERCENT COVERAGE

METHOD OF REPORTING ALL INDICATIONS, INCLUDING SIZE, TYPE, LOCATION, ETC.

COPIES OF ALL TEST REPORTS SHALL BE FURNISHED TO THE CONTRACTING OFFICER AND TO THE CONTRACTOR AND SHALL INCLUDE:

ALL DEFECTS IN EXCESS OF 10 PERCENT OF THE BACK REFLECTION

SKETCHES OF LOCATION OF DEFECTS

DESCRIPTIONS BOTH IN PERCENT OF BACK REFLECTION AND LOSS OF BACK REFLECTION

THE MANUFACTURER SHALL ACCEPT THE RESPONSIBILITY FOR RECOGNIZED DEFECTS, SUCH AS FLAWS, CRACKS, OR RUPTURES, AS WELL AS SUCH CONDITIONS AS INCLUSIONS, SEGREGATION, VARIATION IN GRAIN SIZE, ETC., WHICH WILL NOT BE REMOVED BY SUBSEQUENT MACHINING AND WHICH ARE CONSIDERED INJURIOUS BY THE CONTRACTING OFFICER. DUE CONSIDERATION WILL BE MADE OF THE LOCATION OF ANY OBSERVED DEFECT.

TO EVALUATE ANY QUESTIONABLE DEFECTS LOCATED ABOVE, THE CONTRACTOR MAY ELECT TO MAKE RADIOGRAPHIC INSPECTION OF THE DEFECTS, THE COST OF WHICH SHALL BE PAID FOR BY THE CONTRACTOR, IN LIEU OF REPLACING THE PART. SUCH INSPECTION SHALL BE MADE BY OR TO THE SATISFACTION OF AND UNDER THE SUPERVISION OF THE GOVERNMENT'S TESTING AGENCY, SELECTED AS NOTED ABOVE. ASTM E-71, INDUSTRIAL RADIOGRAPHIC STANDARDS FOR STEEL CASTINGS, CLASS 2, WILL BE USED TO DETERMINE THE ACCEPTABILITY OF THESE DEFECTS EXCEPT THAT THE REQUIREMENTS OF CLASS 1 SHALL APPLY FOR THE SHRINKAGE ALLOWED. THE CONTRACTING OFFICER SHALL BE THE SOLE JUDGE AS TO THE ACCEPTANCE OF ANY SUCH DEFECT AND HIS DECISION SHALL BE FINAL.

ACCEPTANCE BY THE CONTRACTING OFFICER MAY BE CONDITIONAL UPON REMOVAL OF CERTAIN DEFECTS BY SUBSEQUENT MACHINING. IN THIS CASE, IF THE MANUFACTURER ELECTS TO PROCEED WITH ANY MACHINING WORK, SUCH WORK SHALL BE AT HIS OWN RISK AND IF SUBSEQUENTLY REJECTED BY THE CONTRACTING OFFICER, THE CONTRACTOR WILL REPLACE THE PART AT HIS OWN EXPENSE.

ACCEPTANCE BY THE CONTRACTING OFFICER OF ANY PART SO INSPECTED DOES NOT JEOPARDIZE HIS RIGHT TO REJECT SAID PART IF UPON SUBSEQUENT FABRICATION AND INSPECTION DEFECTS ARE FOUND TO EXIST THAT ARE CONSIDERED INJURIOUS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACEMENT COSTS AND TIME DELAY RESULTING FROM THE REJECTION OF ANY PART FOUND TO BE DEFECTIVE BY ANY OF THE REQUIRED INSPECTION FACILITIES OR ADDITIONAL INSPECTION BY THE GOVERNMENT.

[illegible] SPECIFIED BY THE CONTRACTOR

SPHERICAL CONNECTION ASSEMBLIES FURNISHED AND INSTALLED BY THE CONTRACTOR WILL NOT REQUIRE NONDESTRUCTIVE TESTING EXCEPT FOR THE WELDING PERFORMED THERETO BY THE CONTRACTOR. A

WELDS SHALL BE INSPECTED AS REQUIRED BY THEIR RESPECTIVE TYPE.

RADIOGRAPHIC INSPECTION SHALL BE FOR THE ENTIRE LENGTH OF THE SPECIFIED WELD. RADIOGRAPHY SHALL CONFORM TO THE REQUIREMENTS OF THE REFERENCED ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, PARAGRAPH UW-51.

THE RADIOGRAPHY SHALL BE PERFORMED OR WITNESSED BY A RECOGNIZED INDEPENDENT TESTING LABORATORY SELECTED AND PAID FOR BY THE CONTRACTOR AS SPECIFIED HEREINBEFORE. THE INSPECTION AGENCY SHALL RECOMMEND THE TECHNIQUE AND PROCEDURE FOR PERFORMANCE OF THE RADIOGRAPHY AND REPORT OF DEFECTS FOR REVIEW AND COMMENT BY THE CONTRACTOR AND APPROVAL BY THE CONTRACTING OFFICER.

THE INSPECTION AGENCY WILL RETAIN A COPY OF THE FIDA FOR REVIEW BY THE CONTRACTOR AND/OR THE CONTRACTING OFFICER UNTIL COMPLETION OF THE CONTRACT AND FOR FIVE YEARS THEREAFTER. THE INSPECTION AGENCY SHALL MAKE A WRITTEN REPORT TO THE CONTRACTING OFFICER REPORTING EACH INSPECTION AND DEFECT NOTED, IF ANY, WITH COPY TO THE CONTRACTOR.

ACCEPTANCE AND REJECTION OF WELD DEFECTS WILL BE IN ACCORDANCE WITH ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, PARAGRAPH UW-51.

MAGNETIC PARTICLE INSPECTION SHALL BE PERFORMED ON THE SPECIFIED WELDS IN ACCORDANCE WITH ASTM E-109, DRY MAGNETIC PARTICLE INSPECTION.

FOR 100 PERCENT MAGNETIC PARTICLE INSPECTION (GROUP II WELDS), THE SEQUENCE OF INSPECTION SHALL BE:

100 PERCENT OF ROOT PASS

100 PERCENT AFTER EACH 1/2 INCH WELD DEPOSIT

100 PERCENT OF FINAL WELD

THE WELDED SURFACE AT INSPECTION SHALL BE FREE OF SCALE, SLAG, ETC., WHICH MIGHT INTERFERE WITH THE INSPECTION AND SHALL HAVE A TEMPERATURE NOT EXCEEDING 150 DEGREES FAHRENHEIT.

MAGNETIC PARTICLE INSPECTION SHALL BE UNDER THE SUPERVISION OF THE GOVERNMENT'S INSPECTOR AND THE CONTRACTING OFFICER SHALL RECEIVE REPORTS OF ALL INSPECTIONS AND RESULTS.

DEFECTS FOUND UNDER EITHER THE RADIOGRAPHIC OR MAGNETIC PARTICLE INSPECTION THAT ARE REMOVED AND REWELDED SHALL BE REINSPECTED BY THE SAME PROCEDURES ORIGINALLY USED IN THE AREA OF THE REPAIR WELDING.

ALL MACHINED PARTS SHALL BE INSPECTED 100 PERCENT BY MAGNETIC PARTICLE INSPECTION FOLLOWING FINISH MACHINING. INSPECTION SHALL BE PERFORMED IN ACCORDANCE WITH ASTM E-109, DRY MAGNETIC PARTICLE INSPECTION.

ALL FORGINGS THAT WILL RECEIVE WELDS REQUIRING RADIOGRAPHIC INSPECTION SHALL BE RADIOGRAPHED 100 PERCENT IN THE AREA WITHIN 1-1/2 INCH OF THE FINISHED WELD JOINT. ANY DEFECTS

NOTED THAT, IN THE OPINION OF THE INSPECTION AGENCY AND THE CONTRACTOR, WILL CREATE PROBLEMS OR INCREASE IN SCOPE DURING WELDING SHALL BE REMOVED AND REPAIRED OR THE PART SHALL BE REJECTED. SUCH REPAIR AND/OR REPLACEMENT SHALL BE PAID FOR BY AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

ADDITIONAL INSPECTIONS AND/OR TESTS OTHER THAN ABOVE OUTLINED, MAY BE REQUIRED FOR ITEMS SPECIFIED HEREIN AS MAY BE LATER DETERMINED BY THE CONTRACTING OFFICER. THE COST OF SUCH ADDITIONAL INSPECTIONS AND TESTS REQUESTED SHALL BE PAID FOR BY THE GOVERNMENT; HOWEVER, THE COST OF REWORKING, AND/OR REPLACING OF MATERIAL THEREBY FOUND TO BE DEFECTIVE SHALL BE PROVIDED BY THE CONTRACTOR WITHOUT COST TO THE GOVERNMENT. TIME DELAYS RESULTING FROM PARTS FOUND THUS TO BE DEFECTIVE, SHALL ALSO BE THE RESPONSIBILITY OF THE CONTRACTOR.

NOTHING IN THIS SECTION OF THE SPECIFICATIONS SHALL BE DEEMED IN ANY WAY TO LIMIT THE RIGHTS OF THE GOVERNMENT UNDER GENERAL PROVISIONS OF THIS CONTRACT ENTITLED "INSPECTION AND ACCEPTANCE".

FINISHES

MACHINED SURFACES SHALL HAVE AN AVERAGE ROUGHNESS HEIGHT AS DEFINED BY AMERICAN STANDARDS ASSOCIATION SPECIFICATION B46.1.

THE MATING SURFACES OF ALL MECHANICAL PARTS SHALL HAVE A ROUGHNESS HEIGHT MEETING THE REQUIREMENTS OF AISI STANDARD NO. 6 OR AGMA STANDARDS AS APPLICABLE.

SURFACES OTHER THAN THE ABOVE ON WHICH MACHINING IS REQUIRED SHALL HAVE ROUGHNESS HEIGHT NOT GREATER THAN:

SURFACES WHICH MATE	63 MICROINCHES
OTHER SURFACES	125 MICROINCHES

OTHER THAN THE ABOVE, ALL OTHER SURFACES WHICH ARE VISIBLE AND ON THE EXTERIOR OF THE STRUCTURES SHALL HAVE A FINISHED SURFACE ROUGHNESS HEIGHT NOT GREATER THAN 250 MICROINCHES.

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PAINTING AND TEMPORARY CORROSION PROTECTION

ALL EXPOSED SURFACES, EXCEPT METAL-TO-METAL SLIDING SURFACES AND PLATED THREADS, SHALL BE CLEANED AND PAINTED IN ACCORDANCE WITH THE SECTION ENTITLED "PAINTING". THE CONTRACTOR SHALL PROTECT ALL UNPAINTED, MACHINED SURFACES FROM CORROSION FROM ANY CAUSE DURING SHIPMENT, STORAGE AT THE SITE AND CONSTRUCTION OPERATIONS SUCH THAT THESE SURFACES ARE IN A NEW CONDITION, FREE FROM RUST AND CORROSION AT THE TIME OF FINAL ACCEPTANCE. THE COMPANY PROTECTION SHALL GENERALLY BE A WAX OR GREASE TYPE MATERIAL SPECIFICALLY FORMULATED AS A TEMPORARY PROTECTIVE COATING FOR MACHINED SURFACES. THE TEMPORARY COATING SHALL BE COMPLETELY REMOVED AND THE SURFACES PROPERLY LUBRICATED PRIOR TO FINAL ACCEPTANCE. THE TEMPORARY COATINGS AND THE OPERATIONS OF APPLICATION OR REMOVAL SHALL NOT DAMAGE OR DETRACT FROM THE ULTIMATE PROPERTIES OF THE EQUIPMENT PROTECTIVE COATINGS. COATINGS SHALL BE SUBMITTED TO THE CONTRACTING OFFICER FOR APPROVAL IN CONJUNCTION WITH THE SUBMISSION OF SHOP DRAWINGS. CORROSION OF SPHERICAL BEARING SURFACES, POLISHED THREADS AND ALL PARTS HAVING FINISHES OF 32 MICROINCHES OR LESS SHALL BE CAUSE FOR REJECTION.

DAMAGES TO EQUIPMENT, SURFACES AND FINISHES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EQUIPMENT, SURFACES AND FINISHES FROM ANY CAUSE PRIOR TO FINAL ACCEPTANCE OF THE TOTAL WORK COVERED BY THESE SPECIFICATIONS AND CONTRACT FOR THE TOTAL WORK. ALL DAMAGES SHALL BE REPAIRED AND/OR REFINISHED TO THE FULL SATISFACTION OF THE CONTRACTING OFFICER OR SHALL BE REPLACED WITH MATERIAL ACCEPTABLE TO AND APPROVED BY THE CONTRACTING OFFICER.

LUBRICATION

ALL SURFACES WHERE METAL-TO-METAL SLIDING CONTACT OCCURS SHALL BE LUBRICATED BY HAND BRUSH APPLICATION DURING ASSEMBLY WITH AN ANTIGALLING, ANTISEIZING, EXTREME PLASTIC PRESSURE, SOLID TYPE LUBRICANT IN PASTE FORM EQUAL TO "MOLYKOTE G-N" MANUFACTURED BY ALPHA-MOLYKOTE CORPORATION OF STAMFORD, CONNECTICUT. THE LUBRICANT SHALL HAVE THE ABILITY TO MAINTAIN A FILM OVER EXPOSED METAL SURFACES TO PROVIDE PROTECTION FROM ATMOSPHERIC AND SEA WATER SPRAY CORROSION CONDITIONS AS ENCOUNTERED ON THE ATLANTIC COAST OF FLORIDA. FINAL SELECTION OF LUBRICANT SHALL BE APPROVED BY THE CONTRACTING OFFICER. ALL SLIDING METAL SURFACES, EXCEPT THREADS OF SMALLER SIZED BOLTS, SHALL BE PROVIDED WITH DRILLED LUBRICANT HOLES EQUIPPED WITH HIGH PRESSURE GUN-TYPE LUBRICANT FITTINGS CONFORMING TO MIL-F-3541.

SHOP ASSEMBLY

EACH TRUCK ASSEMBLY SHALL BE COMPLETELY ASSEMBLED AND ERECTED IN THE SHOP, LUBRICATED IN ACCORDANCE WITH THE PARAGRAPH TITLED "LUBRICATION", AND OPERATED WITHOUT LOAD TO INSURE PROPER MATING AND FIT OF ALL PARTS. THE GOVERNMENT'S AUTHORIZED REPRESENTATIVES SHALL BE PRESENT TO WITNESS AND VERIFY ALL SHOP TESTS.

TRUCK ASSEMBLIES SHALL BE FABRICATED FROM STRUCTURAL QUALITY ROLLED STEEL SHAPES OR PLATE, MILLED OR FORMED TO THE REQUIRED PROFILE WITH BOSSES WHERE NECESSARY TO SUPPORT EQUALIZING BEAMS, AND FITTED WITH SAFETY HANGERS AND END BUMPERS.

THE WHEEL BASE OF THE TRUCK ASSEMBLY SHALL BE AS SHOWN ON THE DRAWINGS. SAFETY LUGS SHALL BE PROVIDED TO LIMIT THE DROP TO NOT MORE THAN 0.5 INCH IN THE EVENT OF WHEEL OR AXLE BREAKAGE, AND TO MAINTAIN THE TRUCK ON THE TRACK RAILS.

---WELDED CONSTRUCTION

THE PROCEDURES FOR THE WELDING METHOD EMPLOYED, THE APPEARANCE AND QUALITY OF WELDS MADE, AND THE METHODS USED IN CORRECTING WELDING WORK SHALL CONFORM TO AWS CODE, SECTION 3, "WORKMANSHIP", AND SECTION 4, "TECHNIQUE".

---GEAR ASSEMBLY

GEARS AND BEARINGS SHALL CONFORM TO AISE STANDARD NO. 6. GEARS SHALL BE MACHINE CUT FROM HEAT-TREATED ALLOY STEEL INDUCTION HARDENED STEEL WITH AN AVERAGE BRINELL HARDNESS OF 280 TO 300.

GEAR SHAFTS SHALL BE MANUFACTURED FROM HIGH CARBON STEEL OR ALLOY STEEL, MACHINED AND GROUND FOR ACCURATE FIT, AND SPLINED FOR FITTING TO THE MATING GEAR.

GEAR TRAIN ASSEMBLY SHALL BE CARRIED ON ANTI-FRICTION BEARINGS AND ENCLOSED IN THE FRAME CASTING. ASSEMBLY SHALL OPERATE IN A SEALED OIL BATH. FRAME CASTING SHALL BE PROVIDED WITH LUBRICATION FITTINGS AND INSPECTION PORTS.

NOT USED

---BEARINGS

ALL BEARINGS IN THE MECHANISM SHALL BE PRECISION MANUFACTURED ANTI-FRICTION BEARINGS, EITHER NEEDLE TY ROLLER BEARINGS OR END AND RADIAL THRUST BALL BEARINGS, OPERATING IN AN OIL BATH, AND CONFORMING TO THE REQUIREMENTS SPECIFIED UNDER THE ARTICLE ENTITLED "PERFORMANCE REQUIREMENTS".

EXPOSED BEARINGS SHALL BE PERMANENTLY SEALED AND FACTORY PRELUBRICATED.

---FRAME AND HOUSING

ALL OPERATING PARTS SHALL BE MOUNTED AND ENCLOSED IN A SEALED, FACTORY PAINTED METAL FRAME OF MALLEABLE IRON, CAST STEEL, WELDED STEEL OR ALUMINUM.

WELDED OR BOLTED FRAMES SHALL BE DESIGNED TO CARRY ALL LOADS ON THE FABRICATED PIECES, WELDS OR BOLTS SHALL BE USED ONLY TO HOLD THE FABRICATED PARTS IN POSITION.

PROVIDE MEANS FOR ADEQUATE LUBRICATION OF ALL MOVING PARTS AND FOR FILLING, DRAINING AND CHECKING THE LEVEL OF THE LUBRICANT.

LUBRICANT SHALL BE DESIGNED FOR USE IN AN AMBIENT TEMPERATURE OF 0 DEGREES FAHRENHEIT TO 120 DEGREES FAHRENHEIT. TRUCK ASSEMBLIES SHALL BE CONSPICUOUSLY TAGGED TO IDENTIFY THE LUBRICANTS USED AND THEIR TEMPERATURE RANGE. COMPLETE TRUCK COMPLEXES SHALL BE COMPLETELY LUBRICATED AFTER INSTALLATION AND PRIOR TO ACCEPTANCE TESTING.

FITTINGS SHALL BE LOCATED AS REQUIRED FOR EASY ACCESSIBILITY FOR LUBRICATION. PRESSURE LUBRICATION FITTINGS SHALL NOT BE USED WHERE NORMAL LUBRICATING PRESSURE MAY DAMAGE GREASE SEALS OR OTHER PARTS.

VERTICAL GEAR TRAINS SHALL BE PROVIDED WITH POSITIVE LUBRICATION TO THE UPPER GEARS AND TO OIL-LUBRICATED BEARINGS. ENCLOSED REDUCTION GEARING SHALL BE LUBRICATED IN AN OIL BATH. CASES FOR OIL BATHS SHALL HAVE A DRAIN PLUG, DUSTTIGHT AND WEATHERTIGHT FILLER OPENING, AND A READY MEANS FOR DETERMINING THE OIL LEVEL. GREASE LUBRICATED BEARINGS SHALL BE LUBRICATED THROUGH INDIVIDUAL PRESSURE LINES TO EACH BEARING. EACH LINE SHALL BE EQUIPPED WITH A LUBRICATION FITTING. DUST TIGHT AND WEATHERTIGHT COVERS WILL BE ACCEPTED IN LIEU OF OIL BATH ENCLOSURE. ⚠

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BEARINGS SHALL BE PROVIDED WITH A POSITIVE OIL FEED, OR SHALL BE GREASE LUBRICATED, AND FITTED WITH SHIELDS TO PREVENT ENTRY OF GREASE TO GEAR OIL. WORM GEAR HOUSING SHALL BE INTEGRAL WITH THAT FOR OTHER GEARS IN THE TRAIN. NO LUBRICANT SHALL BE PERMITTED TO CONTACT MOTOR WINDINGS. EXPOSED BEARINGS SHALL BE FITTED WITH DUSTTIGHT SEALS.

---FACTORY LUBRICATION

WHERE PRACTICABLE, ALL MOVING PARTS OF TRUCK ASSEMBLIES SHALL RECEIVE A FULL LUBRICATION CHARGE PRIOR TO DELIVERY. LUBRICANT SHALL CONFORM TO AGMA STANDARDS 250.07 AND SUPPLEMENT 250.03A, TYPE AS RECOMMENDED BY MANUFACTURER.

---MOTORS AND CONTROLS---

---GENERAL

MOTORS AND CONTROLS SHALL CONFORM TO NEMA STD. AND TO THE REQUIREMENTS SPECIFIED HEREIN. MOTOR MOUNTING, SHAFT AND KEYWAY DIMENSIONS SHALL CONFORM TO MANUFACTURER'S STANDARDS.

WIRING, CONDUCTORS, CONTROLS, OVERCURRENT PROTECTION AND GROUNDING SHALL CONFORM TO NEC, NFPA 70-1975 AND TO THE REQUIREMENTS SPECIFIED HEREIN.

---MOTOR HORSEPOWER RATING

MOTOR HORSEPOWER RATINGS SHALL NOT BE LESS THAN THOSE DETERMINED BY EITHER THE FOLLOWING FORMULAS WHERE:

HP - EQUALS T TIMES V TIMES QUANTITY 1 PLUS A TIMES FC TIMES FA; QUANTITY DIVIDED BY 33,000; OR

HP - EQUALS T TIMES V TIMES QUANTITY 1.3 PLUS 0.002V TIMES FC TIMES FA; QUANTITY DIVIDED BY 33,000; AND WHERE:

T - TRACTIVE EFFORT IN POUNDS

V - RATED VELOCITY IN FPM

A - HP QUANTITY TO ALLOW FOR ACCELERATION

FA - 1.3

FC - 1.0

THE TRACTIVE EFFORT IN POUNDS, INCLUDING ALLOWANCE FOR FRICTION IN DRIVE MECHANISM GEARS AND BEARINGS, [illegible] LL BE BASED ON 15 POUNDS PER NET TON FOR SPUR GEAR DRIVES, AND 20 POUNDS PER NET TON FOR WORM [illegible] RED DRIVES. THE ESTIMATED WEIGHTS USED FOR THESE CALCULATIONS SHALL BE INCLUDED IN THE PREPRODUCTION DESIGN DATA. THE TRACTIVE EFFORT SHALL INCLUDE WIND LOAD. UNLESS OTHERWISE SPECIFIED, WIND LOAD SHALL BE BASED ON SQUARE FOOT OF EXPOSED SURFACE APPLIED AT THE ANGLE INDICATED ON THE SCHEMATIC ARRANGEMENT DRAWINGS. MAXIMUM FULL LOAD TRAVEL SPEEDS SHALL BE NOT LESS THAN AS SPECIFIED, AND OTHERWISE INDICATED ON THE SCHEMATIC ARRANGEMENT DRAWINGS.

ALL MOTORS SHALL BE TOTALLY ENCLOSED, FAN COOLED WITH A NON SPARK-PRODUCING FAN SUITABLE FOR A GROUP B ATMOSPHERE AND THE JUNCTION BOX SHALL BE SUITABLE FOR CLASS I DIVISION 1 GROUP B. COMPRESSED AIR WILL BE FURNISHED TO THE COMMUTATOR SECTION TO PURGE IT DURING OPERATION. A NASA APPROVED BLEED ORIFICE SHALL BE INSTALLED TO MAINTAIN A PURGING AIR FLOW THROUGH THE MOTOR. THE MOTOR SHALL BE SUITABLE FOR AN ADJUSTABLE VOLTAGE ARMATURE SUPPLY AND SHALL HAVE CLASS H INSULATION TO PROVIDE THE CONTINUOUS RATING IN AN AMBIENT OF 40 DEGREES C WITH A 1.0 SERVICE FACTOR AND SHALL BE CERTIFIED FOR 30 MINUTE TIME RATED OPERATION AT FULL NAMEPLATE POWER OUTPUT IN AN AMBIENT TEMPERATURE OF 40 DEGREES CELCIUS. THE MOTOR SHALL ALSO BE RATED FOR CONTINUOUS OPERATION THROUGHOUT THE SPECIFIED TRAVEL SPEED RANGE. ⚠3

---MOTOR BEARINGS

MOTOR BEARINGS SHALL BE HEAVY DUTY BALL OR ROLLER ANTI-FRICTION TYPE WITH FULL PROVISION FOR THE TYPE OF THRUST IMPOSED BY THE SPECIFIC DUTY LOAD AND MEETING THE REQUIREMENTS SPECIFIED UNDER THE ARTICLE ENTITLED "PERFORMANCE REQUIREMENTS".

BEARINGS IN ALL MOTORS SHALL BE EITHER FACTORY SEALED AND LUBRICATED-FOR-LIFE, OR RELUBRICATED AND EQUIPPED WITH LUBRICATION SERVICE FITTINGS AND WITH PROVISION FOR AUTOMATIC POSITIVE RELIEF OF LUBRICATION PRESSURE, ACCOMPLISHED BY EITHER BUILT-IN RELIEF DEVICES OR AUTOMATIC BALL-AND-SPRING RELIEF FITTINGS AT THE BOTTOM OF THE BEARING HOUSING. PRESSURE RELIEF SHALL BE TO THE OUTSIDE OF THE HOUSING. LUBRICATION FITTINGS SHALL BE FITTED WITH COLOR CODED PLASTIC OR METAL DUST CAPS.

BEARINGS IN ANY MOTOR WHICH IS LUBRICATED AT THE FACTORY FOR EXTENDED DUTY PERIODS SHALL BE SO IDENTIFIED WITH LABELS OR TAGS. TAG SHALL STATE THE LUBRICATION REQUIREMENTS FOR A GIVEN NUMBER OF OPERATING HOURS.

---MOTOR BRAKES

PROVIDE MOTOR BRAKES ON ALL ELECTRIC MOTORS. MOTOR BRAKE SHALL BE AN EXTERNALLY ADJUSTABLE, ELECTRICALLY OPERATED SHOE OR MULTIPLE FRICTION ELECTRO-MAGNETIC DISC BRAKE, WHICH SHALL APPLY

THE BRAKE ELECTRIC CIRCUIT SHALL BE ISOLATED FROM THE MOTOR CIRCUIT SO THAT A FAILURE OF AN INDIVIDUAL MOTOR WILL NOT ACTIVATE THE BRAKES. B

AUTOMATICALLY WHEN THE POWER IS INTERRUPTED. APPLICATION OF BRAKES SHALL BE CONTROLLED TO PROVIDE SMOOTH JERK-FREE STOPS AND STARTS. BRAKES SHALL BE DESIGNED TO BE ENERGIZED BY BRAKE CIRCUIT FAILURE, CONTROLLER SHUTDOWN, OPERATOR CONTROL OR EMERGENCY STOP BUTTON. B

THE TORQUE RATING OF THE BRAKES SHALL BE NOT LESS THAN 150 PERCENT OF THE FULL LOAD TORQUE OF THE MOTORS AND SHALL BE ADJUSTABLE TO 25 PERCENT FOR ALL DUTY CLASSES. THE BRAKE SHALL BE HOUSED IN A WEATHERPROOF ENCLOSURE SUITABLE FOR EXPOSURE TO SALT AIR AND CERTIFIED FOR OPERATION IN A CLASS 1, DIVISION 1, GROUP B, ATMOSPHERE WHEN PRESSURIZED AND PURGED WITH COMPRESSED AIR.

---MOTOR CONTROL

THE CONTROL SYSTEM SHALL BE A FOUR QUADRANT REGENERATIVE D.C. DRIVE SYSTEM WITH SOLID STATE COMPONENTS CAPABLE OF MAINTAINING A PRESET SPEED DURING VARYING WIND CONDITIONS THAT WOULD TRY TO ACCELERATE OR DECELERATE THE PCR STRUCTURE. THE CONTROL SYSTEM SHALL BE SPLIT INTO TWO SECTIONS, EACH SECTION SHALL DRIVE ONE-HALF (1/2) THE NUMBER OF DRIVE MOTORS REQUIRED. THE CONTROLLER SHALL OPERATE FROM A 480 VOLT, 3 PHASE, 60 HERTZ SUPPLY WITH A SEPARATE SUPPLY BEING PROVIDED TO EACH ONE-HALF (1/2) OF THE UNIT. THE TWO DRIVE UNITS SHALL BE INTERCONNECTED WITH A LOAD SHARING LOGIC SYSTEM. THE CONTROLS SHALL BE ADJUSTABLE OVER THE UNIT'S ENTIRE SPEED RANGE BUT THIS SHALL ONLY BE ACHIEVED FROM WITHIN THE CABINET OF THE MAIN CONTROLLER. ACCELERATION AND DECELERATION RATES SHALL BE ADJUSTABLE WITHIN THIS CABINET BUT NOT ACCESSIBLE AT THE OPERATOR'S STATION. THE OPERATOR'S CONTROL STATION IS ESSENTIALLY A TWO SPEED CONTROL STATION WITH FULL SPEED AND INCH MODES ONLY AVAILABLE. WITHIN THE MAIN VARIABLE SPEED CONTROL CABINET THERE SHALL EXIST CONTROLS FOR ADJUSTING THE MINIMUM SPEED OF 0.125 INCHES PER SECOND UPWARD AND THE MAXIMUM SPEED OF 5.0 INCHES PER SECOND DOWNWARD. THIS SPEED RANGE RESULTS IN A SPEED RATIO OF 40 TO 1. THE CONTROLLER SHALL ALSO PROVIDE THE REQUIRED CIRCUITRY TO PERMIT ONLY THE MINIMUM TRAVEL SPEED AFTER THE PCR STRUCTURE HAS TRIPPED A "LOW SPEED ONLY" SWITCH. SEE PARAGRAPH "SKEW CONTROL." ~~THE REGENERATIVE CYCLE MUST NOT FEED BACK INTO THE POWER SOURCE BUT MUST BE DISSIPATED BY RESISTORS OR OTHER MEANS COMPATIBLE WITH THE CONTROLLER.~~ C B

---MOTOR CONTROLLER ENCLOSURE 32 E

MOTOR CONTROL ENCLOSURES SHALL CONFORM TO NEMA STANDARD 9 AND SHALL BE FABRICATED IN THE FOLLOWING MANNER:

THE CONTROLLER ENCLOSURE SHALL HAVE AN INTEGRAL COOLING SYSTEM WITH AN AIR TO AIR UNIT CERTIFIED FOR OPERATION IN A CLASS 1, DIVISION 1, GROUP B, ATMOSPHERE. THE CABINET AND COMPONENTS SHALL BE SUITABLE FOR DRY NITROGEN PURGING. A STANDARD NASA BLEED ORIFICE SHALL BE AFFIXED TO ASSURE A NITROGEN FLOW THROUGH THE CABINET. THE ENCLOSURE MATERIALS SHALL BE SUITABLE FOR EXPOSURE TO SALT AIR. THE COMPONENTS SHALL BE HOUSED IN A FREE STANDING CABINET NOT OVER 90 INCHES HIGH WITH INTERNAL BAFFLES TO SEPARATE UNITS. B

SHEET STEEL FOR CONTROL ENCLOSURES SHALL BE FABRICATED FROM COMMERCIAL QUALITY UNCOATED CARBON STEEL CONFORMING TO ASTM A366-72.

STAINLESS STEEL FOR CONTROL ENCLOSURES SHALL BE FABRICATED FROM CORROSION-RESISTING CHROMIUM-NICKEL STEEL SHEET CONFORMING TO ASTM A167-70, TYPE 300 SERIES, NO. 4 FINISH.

BOX DIMENSIONS AND THICKNESS OF STEEL SHALL CONFORM TO UL 50, AUGUST 1972, "CABINETS AND BOXES."

SHEET STEEL AND CAST IRON ENCLOSURES SHALL BE CHEMICALLY CLEANED, THEN PHOSPHATIZED AND THEN PAINTED, BOTH INTERIOR AND EXTERIOR, WITH THE MANUFACTURER'S STANDARD FINISH, TO A MINIMUM DRY FILM THICKNESS OF 2 MILS. ENCLOSURE INTERIORS SHALL BE PAINTED WHITE OR LIGHT GRAY.

---PROTECTIVE EQUIPMENT

PROTECTIVE DEVICES SHALL CONFORM TO NEMA ICS-1-1967 AND SHALL INCLUDE A CIRCUIT BREAKER FOR EACH MOTOR CONTROLLER, INSTANT OVERCURRENT, OVERVOLTAGE PROTECTION, AND OVERTORQUE PROTECTION CIRCUITS. OVERLOAD PROTECTION CONTROLS SHALL BE COORDINATED WITH THE RATING OF THE GEAR TRAIN SYSTEM. MOTOR CHARACTERISTIC CURVES SHALL BE SUBMITTED WITH THE SHOP DRAWINGS SHOWING THE OVERLOAD SET POINTS. ⚠1

---PUSHBUTTON CONTROL STATIONS

PUSHBUTTONS AND PUSHBUTTON STATIONS FOR CONTROL SHALL BE HEAVY-DUTY, OIL-TIGHT MOMENTARY CONTACT DEVICES RATED 600 VOLTS WITH THE NUMBER OF BUTTONS AND THE MARKING OF NAMEPLATES IN ACCORDANCE WITH NEMA ICS-1970 SECTION 2, "STANDARDS FOR INDUSTRIAL CONTROLS." THE COLOR CODE FOR PUSHBUTTONS SHALL BE IN ACCORDANCE WITH TABLE 9-1 OF AEC EMP-1/EGP-1-1967.

---OPERATOR'S STATION

THE OPERATOR'S STATION SHALL CONSIST OF A WOBBLE STICK TYPE DEADMAN CONTROL. THIS CONTROL SHALL BE HOUSED IN A COMPRESSED AIR PURGED STATION. THIS SHALL PROVIDE A CONTROL SYSTEM SUITABLE FOR OPERATION IN A CLASS I, DIVISION 1, GROUP B, ATMOSPHERE AND YET BE MOUNTED IN A NEMA 12 OIL-TIGHT CONTROL STATION. THE CONTROL POINT SHALL BE THE OUTBOARD LEADING EDGE OF THE LEADING TRUCK AS THE PCR STRUCTURE MOVES IN THE FORWARD OR MATING DIRECTION. A PLATFORM SHALL BE PROVIDED AT THIS POINT TO ALLOW THE OPERATOR TO RIDE WITH THE CONTROL STATION.

---LIMIT SWITCHES

PROVIDE ADJUSTABLE TRUCK LIMIT SWITCH TO PREVENT OVER TRAVEL. LIMIT SWITCHES SHALL BE ARRANGED TO STOP THE MOTOR AND APPLY THE MOTOR BRAKE BEFORE REACHING THE SAFE LIMIT OF TRAVEL.

---SKEW CONTROL

EACH TRUCK ASSEMBLY SHALL HAVE FOUR DRIVE MOTORS WITH EACH MOTOR DRIVING TWO WHEELS THRU A GEAR TRAIN. THE STRUCTURE CONNECTING THE TWO TRUCK ASSEMBLIES MAY BE CONSIDERED RIGID. HOWEVER, EACH INDIVIDUAL TRUCK ASSEMBLY IS CONNECTED TO THE STRUCTURE WITH A SPHERICAL BALL JOINT THEREBY CAUSING THE INDIVIDUAL TRUCK ASSEMBLY TO BE FLEXIBLE IN TERMS OF SKEW AND ALIGNMENT RELATIVE TO THE RAILS. THE INDIVIDUAL MOTORS SHALL BE CONTROLED THRU A LOAD SHARING CIRCUIT SPECIFICALLY DESIGNED FOR THIS MULTIMOTOR DRIVE SYSTEM. AUTOMATIC SKEW CORRECTION SHALL BE DESIGNED INTO THE CONTROL SYSTEM AS MEASURED BY A SKEW LIMIT SWITCH MOUNTED BETWEEN THE TRUCK FRAME AND RAIL.

---SPEED CONTROL

THE 2 SPEED OPERATION SHALL USE AS REFERENCE A SENSITIVE LOW SPEED TACHOMETER MOUNTED ON THE MOTOR OUTPUT SHAFT AND SHALL BE OF A RANGE SUITABLE FOR THE DRIVE OUTPUT TO BE WITHIN THE PRESET SPEED RANGES OF 0.125 TO 4.0 INCHES PER SECOND. THE ACCELERATION AND DECELERATION OF THE DRIVE SYSTEM SHALL BE ADJUSTABLE FROM WITHIN THE MAIN DRIVE CONTROL CABINET AND SHALL PRODUCE SMOOTH, JERK-FREE STOPPING AND STARTING. △E

---ELECTRICAL FEATURES

THE DRIVE CONTROL SYSTEM SHALL BE SOLID STATE REGENERATIVE AND ADJUSTABLE SPEED D.C., INCLUDING THE FOLLOWING FEATURES:

STEPLESS, PRECISE, SPEED CONTROL FROM MAXIMUM TO MINIMUM DURING AUTOMATIC ACCELERATION TO, AND DECELERATION FROM, EITHER THE INCH OR FULL SPEED MODE, FULL REGENERATIVE BRAKING FOR 40 KNOT OVERHAULING WIND LOADS ON PCR, AUTOMATIC TIMED ACCELERATION AND DECELERATION. MULTIMOTOR LOAD SHARING WITH SKEW CONTROL. REVERSING, ELECTRICAL PROTECTIVE SYSTEM SHALL INCLUDE SINGLE PHASE DETECTOR, OVERCURRENT PROTECTION, MOTOR OVERLOAD PROTECTION, VOLTAGE SURGE TO CONTROLLER PROTECTION, MOTOR HIGH TORQUE PROTECTION (MAXIMUM 150 PERCENT OF MOTOR FULL LOAD), MOTOR OVERSPEED PROTECTION AND CONTROLLER HIGH TEMPERATURE PROTECTION.

---SPECIAL INTERLOCKS

THE DRIVE CONTROL SYSTEM SHALL BE INTERLOCKED WITH THE PERSONNEL ACCESS WALKWAYS TO PROHIBIT THE DRIVES FROM BEING ENERGIZED WHEN THE ACCESS GATE IS IN OTHER THAN "CLOSED" POSITION. THE DRIVE SYSTEM SHALL ALSO BE INTERLOCKED WITH TRAVEL LIMIT SWITCHES LOCATED AT BOTH ENDS OF THE RAILS.

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---ELECTRIFICATION SYSTEM---

---GENERAL

WIRING, CONTACT CONDUCTORS, CONTROLS, OVER CURRENT PROTECTION AND GROUNDING SHALL CONFORM TO NATIONAL ELECTRICAL CODE, NFPA 70-1975 AND TO THE REQUIREMENTS SPECIFIED HEREIN.

---PAINT FINISH---

---GENERAL

TRUCK ASSEMBLY, ELECTRICAL AND MECHANICAL EQUIPMENT SHALL RECEIVE A FACTORY APPLIED PAINT FINISH.

ALL MATERIALS SHALL BE THOROUGHLY BLAST CLEANED OR PICKLED IN ACCORDANCE WITH SSPC-SP 6-63 OR SSPC-SP 8-63 AND THEN GIVEN 2 PRIMER COATS, APPLIED TO A MINIMUM TOTAL DRY COAT THICKNESS OF 3 MILS, AND ONE FINISH COAT, APPLIED TO A MINIMUM DRY FILM THICKNESS OF NOT LESS THAN 2 MILS, TO PROVIDE A TOTAL SYSTEM THICKNESS OF 5 MILS. FINISH COAT COLOR SHALL BE AS SELECTED.

PRIMER SHALL BE A RED LEAD, MIXED PIGMENT-ALKYD VARNISH-LINSEED OIL PAINT CONFORMING TO FS TT-P-86E, TYPE II, OR A ZINC CHROMATE ALKYD PRIMER CONFORMING TO FS TT-P-645.

FINISH COAT SHALL BE AN ALKYD GLOSS ENAMEL, COMPATIBLE WITH THE PRIMER AND CONFORMING TO FS TT-E-489F, CLASS A OR CLASS B, MODIFIED AS FOLLOWS:

PIGMENT SHALL CONTAIN A MINIMUM OF 27 PERCENT RUTILE TITANIUM DIOXIDE, BASED ON THE TOTAL WEIGHT OF THE MATERIAL.

THE VEHICLE SHALL CONTAIN A MINIMUM OF 20 PERCENT ALKYD RESIN SOLIDS AND A MAXIMUM OF 37.0 PERCENT THINNERS AND DRIERS, BASED ON THE TOTAL WEIGHT OF THE MATERIAL.

THE FINISHED ASSEMBLY SHALL BE INSPECTED AFTER ERECTION AND ALL FASTENERS, WELD ABRASIONS AND HANDLING MARKS, SHALL BE PAINTED IN THE FINISH COLOR.

COLOR FINISH OF ALL MOVING PARTS SHALL BE AS SELECTED FROM MANUFACTURER'S STANDARD MACHINERY FINISH COLORS. SEE SECTION 9A PAINTING AND FINISHING FOR COLORS.

COLOR FINISH OF ALL MOVING PARTS SHALL BE BRIGHT ORANGE, COLOR NO. 12246 OF FED-STD 595. OTHER STEEL WORK SHALL BE PAINTED TO MATCH THE COLOR OF EXISTING ADJACENT SURFACES.

OPERATORS' STATIONS SHALL BE BRILLIANT YELLOW, COLOR NO. 13538, OF FEDERAL STANDARD 595. OTHER STEEL WORK SHALL BE PAINTED TO MATCH THE COLOR OF EXISTING ADJACENT SURFACES.

---IDENTIFICATION PLATES---

---PLATE DESCRIPTION

EACH TRUCK SHALL BEAR THE MANUFACTURER'S NAME, SERIAL NUMBER, AND NOT LESS THAN 2 CAPACITY PLATES, WHICH SHALL BE PLACED IN A POSITION WHERE THEY CAN BE READILY SEEN FROM THE FLOOR, FROM EITHER DIRECTION. THE CAPACITY PLATES SHALL BE LETTERED TO INDICATE THE RATED CAPACITY IN POUNDS. THE LETTERS SHALL BE OF SUFFICIENT SIZE TO BE EASILY READ FROM THE FLOOR. BENEATH THE RATED CAPACITY OR CAPACITIES, THERE SHALL BE PLACED IN SMALLER LETTERS, THE NAME OF THE PROCURING AGENCY, AND THE CONTRACT NUMBER UNDER WHICH THE COMPLEX WAS PURCHASED. CAPACITY PLATES SHALL BE CAST IRON WITH RAISED LETTERS PAINTED WHITE WITH BLACK BACKGROUND, OR HEAVY SHEET STEEL WITH PORCELAIN ENAMEL FACE OF CONTRASTING BACKGROUND WITH WHITE LETTERS, OR WHITE BACKGROUND WITH DARK CONTRASTING LETTERS. ENAMELED CAPACITY PLATES SHALL NOT REFLECT LIGHT BEAMS ACROSS CONTROL STATIONS OR WORK AREAS.

INSTRUCTION PLATES, INCLUDING WARNINGS AND CAUTIONS SHALL BE SUITABLE LOCATED, DESCRIBING ANY SPECIAL OR IMPORTANT PROCEDURES TO BE FOLLOWED IN OPERATING AND SERVICING THE EQUIPMENT. PLATES SHALL BE OF COPPER-BASE ALLOY.

---ERECTION---

---GENERAL

TRUCK MANUFACTURER SHALL PROVIDE A QUALIFIED ERECTION SUPERINTENDENT, TO SUPERVISE THE DELIVERY, UNLOADING, ASSEMBLY AND ERECTION OF THE TRUCK ASSEMBLIES; TO INSPECT AND APPROVE THE INSTALLATION AND TO PLACE THE UNITS IN OPERATION.

TRUCKS SHALL BE ASSEMBLED AT THE FACTORY, PROPERLY WIRED, TESTED WITHOUT LOAD AND DISASSEMBLED ONLY AS REQUIRED FOR SHIPMENT. EACH DISASSEMBLED PART SHALL BE MATCH-MARKED FOR FIELD ASSEMBLY.

PROVIDE ADEQUATE AND SAFE ERECTION EQUIPMENT AND TACKLE AS REQUIRED TO MOUNT TRUCKS ON RUNWAY.

—RAILS AND RUNWAYS

THE RUNWAY ASSEMBLY SHALL BE INSPECTED BEFORE ERECTION OF TRUCKS. RAILS SHALL BE LEVEL, IN STRAIGHT ALIGNMENT AND TRUE TO SPAN.

GAGE TOLERANCE FOR SPAN SHALL BE PLUS OR MINUS 0.030 INCH. RAILS SHALL BE HELD TO AN ALIGNMENT AND ELEVATION TOLERANCE OF PLUS OR MINUS 0.0625 INCH.

JOINTS SHALL BE SMOOTH, LEVEL AND IN TRUE ALIGNMENT, SO AS TO OFFER NO OBSTRUCTION TO END TRUCK MOVEMENT. WELDED JOINTS SHALL BE GROUND SMOOTH.

—ERECTION PROCEDURE

ERECT TRUCKS IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS AND AS DIRECTED BY THE MANUFACTURER'S ERECTION SUPERINTENDENT.

FIELD CONNECTIONS SHALL BE BOLTED, EXCEPT WHERE WELDED CONNECTIONS ARE INDICATED, AS FOLLOWS:

HIGH-STRENGTH BOLTED FASTENERS SHALL BE USED FOR ALL BOLTED CONNECTIONS TO END TRUCKS AND FOR ALL STRUCTURAL CONNECTIONS WHERE WELDING IS NOT INDICATED. REUSE OF HIGH-STRENGTH BOLTS IS NOT PERMITTED.

FIELD SPLICES TO GIRDER BRIDGE SHALL BE A CONTINUOUS WELDED CONNECTION, AND SHALL BE PERMITTED ONLY WHERE INDICATED. 3/3 MAGNETIC PARTICLE AND RADIOGRAPHIC INSPECTION SHALL BE PERFORMED. △3

WELDING METHODS, PROCEDURES, AND THE APPEARANCE AND QUALITY OF WELDED WORK SHALL CONFORM TO AWS CODE, SECTION 3 "WORKMANSHIP" AND SECTION 4 "TECHNIQUE".

INSTALL SUPPORT BRACKETS, HANGER CLAMPS AND FASTENERS FOR ELECTRIFICATION SYSTEM, SPACED AT NOT MORE THAN 5 FEET ON CENTER. HOLES TO RECEIVE SUPPORT BRACKETS SHALL BE DRILLED AT THE REQUIRED SPACING.

ALL MOVING PARTS OF THE ASSEMBLY SHALL BE THOROUGHLY LUBRICATED AND GEAR CASES FILLED BEFORE MOTORS ARE TESTED.

BEFORE PERFORMING LOAD TESTS, TRUCKS SHALL BE OPERATED SLOWLY FOR NOT LESS THAN 3 HOURS UNDER VARIED LOADS. ALL MOVING PARTS AND FASTENERS SHALL BE INSPECTED AND ADJUSTED.

---FACTORY TESTS BEFORE SHIPMENT

THE TRUCK MANUFACTURER SHALL ASSEMBLE, WIRE AND TEST EACH TRUCK ASSEMBLY AT THE POINT OF MANUFACTURE FOR THE TESTS SPECIFIED HEREIN AND SHALL SUBMIT THE RESULTS OF THE TESTS AS SPECIFIED UNDER THE PARAGRAPH ENTITLED "PROOFS OF COMPLIANCE", AS FOLLOWS:

MOTOR OPERATION TESTS-----TRUCKS SHALL BE TESTED FOR PERFORMANCE BY BEING INSTALLED ON AN APPROPRIATE TEST STAND. ALL MOTORS SHALL BE OPERATED AT RATED SPEEDS AND FREQUENCIES (OTHERWISE AS TO THE SPECIFIED DUTY CLASS FOR TEMPERATURE OBSERVATION AND MEASUREMENT. WHERE TESTS OF TRUCK MOTORS CANNOT BE CONCURRENT, TEST RESULTS SHALL BE OBTAINED AT THE COMPLETION OF THE OPERATING PERIOD OF EACH MOTOR. TEMPERATURE READINGS OF TEST MOTORS, CONTROLLERS, MOTOR BRAKES, AND AUTOMATIC MECHANICAL LOAD-LOWERING BRAKE OIL BATH SHALL BE RECORDED. WINDINGS SHALL BE TEMPERATURE TESTED BY THE RESISTANCE METHOD. THE TEMPERATURE RISE OF ANY ELECTRICAL PART, INCLUDING THE MOTOR BRAKE, SHALL NOT EXCEED THOSE ALLOWED BY FS CC-M-441C, FS CC-M-441D AND NEMA MG 1-1972 AND ICI-1967, AS APPLICABLE. THE TEMPERATURE OF THE OIL BATH SHALL NOT EXCEED 290 DEGREES FAHRENHEIT AT THE END OF THE EQUIVALENT DUTY CLASS TEST PERIOD. DURING THE TEST THE ASSEMBLY SHALL BE CHECKED FOR EXCESSIVE NOISE AND VIBRATION AND FOR BALANCE DURING OPERATION. MOTOR BRAKES, LIMIT SWITCHES, CONTROL EQUIPMENT, AND WIRING SHALL BE CHECKED FOR PROPER FUNCTIONING. TRAVEL SPEEDS AT THE RATED MOTOR SPEEDS SHALL BE CHECKED FOR CONFORMANCE TO THE SPECIFIED SPEED. FAILURE TO PASS ALL PHASES OF TEST PROCEDURES SHALL BE CAUSE FOR REJECTION OF THE ITEMS TESTED. UNCORRECTABLE DEFECTS SHALL BE CAUSE FOR REJECTION OF THE ASSEMBLY. EACH MOTOR SHALL BE CALIBRATED AT THE FACTORY TO DETERMINE THE ACTUAL RELATION BETWEEN TORQUE AND ARMATURE INPUT CURRENT THROUGHOUT THE OPERATING RANGE FROM ZERO TORQUE TO 150 PERCENT OF FULL LOAD TORQUE. THE CALIBRATION DATA SHALL BE FURNISHED IN THE FORM OF CURVES FOR EACH MOTOR IDENTIFIED BY THE MOTOR SERIAL NUMBER, AND THE CURVES SHALL BE INCORPORATED IN THE MAINTENANCE MANUALS HEREINAFTER SPECIFIED.

CONTROL AND OPERATION TESTS-----ALL CONTROLS SHALL BE OPERATED IN SUCH A MANNER AS TO ACTIVATE ALL LIMIT SWITCHES, LOAD BRAKE AND SAFETY DEVICE. ACTUAL TRAVEL SPEEDS SHALL BE MEASURED, AND COMPARED WITH THE DATA SPECIFIED ON THE SCHEMATIC ARRANGEMENT DRAWINGS. ASSEMBLIES REJECTED BECAUSE OF FAILURE TO PASS THE REQUIREMENTS OF THE EXAMINATION AND TESTS MAY BE OFFERED AGAIN FOR EXAMINATION AND TESTS, PROVIDED ALL DEFECTS HAVE BEEN CORRECTED. TRUCKS SHALL BE OPERATED WITHOUT LOAD TO DETERMINE SUCCESSFUL OPERATION. THE ASSEMBLED TRUCKS SHALL BE SQUARE AND IN ALIGNMENT, WITH ALL PARTS FITTED AND ADJUSTED PROPERLY. OPERATION SHALL BE SMOOTH AND QUIET. BEARINGS SHALL BE COOL RUNNING.

FLANGEWAY AND WHEEL TREAD HARDNESS-----STRUCTURAL MEMBERS SHALL BE TESTED DURING FABRICATION TO INSURE CONFORMANCE TO DESIGN REQUIREMENTS. THE WEARING SURFACES OF NOT LESS THAN THREE REPRESENTATIVE SAMPLES OF TRACK BEAMS AND WHEEL TREADS SHALL BE BRINELL HARDNESS TESTED AND CERTIFIED, IN ACCORDANCE WITH ASTM E10-66.

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—EXAMINATION

EACH COMPLETE TRUCK INCLUDING RUNWAY SYSTEM, CONTROLS, ELECTRIFICATION, AND ALL SUBASSEMBLIES, SHALL BE EXAMINED FOR COMPLIANCE WITH SPECIFIED REQUIREMENTS.

REDESIGN OR MODIFICATION OF THE SUPPLIER'S STANDARD PRODUCT TO COMPLY WITH SPECIFIED REQUIREMENTS, OR NECESSARY REDESIGN OR MODIFICATION FOLLOWING FAILURE TO MEET SPECIFIED REQUIREMENTS, SHALL RECEIVE PARTICULAR ATTENTION FOR ADEQUACY AND SUITABILITY. INSPECTION SHALL ENCOMPASS BOTH VISUAL EXAMINATIONS AND DIMENSIONAL MEASUREMENTS. NONCOMPLIANCE WITH ANY SPECIFIED REQUIREMENTS SHALL CONSTITUTE CAUSE FOR REJECTION.

—TRUCK ASSEMBLY TESTS AFTER ERECTION

AFTER THE COMPLETED TRUCK ASSEMBLY IS ERECTED, ADJUSTED, LUBRICATED, AND MADE READY FOR OPERATION, IT SHALL BE TESTED BY THE CONTRACTOR, IN THE PRESENCE OF THE CONTRACTING OFFICER, TO ASCERTAIN PERFORMANCE AS FOLLOWS:

THE TRUCKS SHALL TRAVEL THE ENTIRE LENGTH OF THE RUNWAY NOT LESS THAN 10 TIMES UNDER RATED LOAD, EACH DURING THE TRAVEL, THE MOTOR BRAKE SHALL BE TESTED AND ADJUSTED TO INSURE THAT THE BRAKES ON THE TRUCK WILL STOP THE TRUCK TRAVEL WITHIN THE DESIGN DISTANCE. △1

POWER SHALL BE CUT OFF AT RANDOM TO CONFIRM OPERATION OF THE BRAKES. TRAVEL SPEED TESTS SHALL BE MADE AND RECORDED AFTER MECHANISMS HAVE ATTAINED ESSENTIALLY STEADY ACCELERATION AND DECELERATION RUNNING STATE. THREE COMPLETE SETS OF FINAL TEST REPORTS SHALL BE PREPARED.

AFTER THE TRUCK DRIVE SYSTEM FURNISHED UNDER THIS SECTION HAS BEEN COMPLETELY INSTALLED, CONNECTED, LUBRICATED AND ADJUSTED AND OTHERWISE COMPLETELY PREPARED FOR OPERATION, INCLUDING THE ABOVE GENERAL CHECKOUT, THE FOLLOWING SPECIFIC TESTS SHALL BE PERFORMED. THROUGHOUT THE CONDUCT OF THE TESTS ALL COMPONENTS SHALL BE CAREFULLY INSPECTED TO INSURE THAT ALL COMPONENTS OPERATE SMOOTHLY AND PROPERLY IN ACCORDANCE WITH THE SPECIFICATION REQUIREMENTS; THAT THERE IS NO EVIDENCE OF MALFUNCTIONING; THAT NONE OF THE COMPONENTS OVERHEAT TO THE EXTENT THAT EXPOSED SURFACE TEMPERATURES EXCEED 240 DEGREES F.; AND THAT THERE ARE NO INTERRUPTIONS DUE TO OPERATION OF THERMAL ALARMS OR OVERCURRENT PROTECTION DEVICES. THE CHARACTERISTIC VALUES OF CURRENT AND VOLTAGE FOR THE VARIOUS CONTROL COMPONENTS UNDER BOTH FULL LOAD AND NO LOAD CONDITIONS SHALL BE MEASURED AND RECORDED FOR INCORPORATION IN THE MAINTENANCE MANUALS HEREINAFTER SPECIFIED. WIND DIRECTION AND VELOCITIES SHALL BE RECORDED FOR EACH TEST.

NORMAL TRACTION

OPERATE THE STRUCTURE AT INCHING SPEED FOR NOT LESS THAN 10 MINUTES IN EACH DIRECTION. RECORD ACTUAL SPEED IN EACH DIRECTION AS DETERMINED BY ACTUAL DISTANCES AND TIMES.

OPERATE THE STRUCTURE AT MAXIMUM SPEED FOR NOT LESS THAN 10 MINUTES IN EACH DIRECTION. RECORD ACTUAL SPEED IN EACH DIRECTION AS DETERMINED BY ACTUAL DISTANCES AND TIMES.

ACCELERATE THE STRUCTURE FROM INCHING SPEED TO FULL SPEED NOT LESS THAN 5 TIMES IN EACH DIRECTION. RECORD AVERAGE ACCELERATION TIME FOR EACH DIRECTION AS MEASURED BY STOP WATCH.

DECELERATE THE STRUCTURE FROM FULL SPEED TO INCHING SPEED NOT LESS THAN 5 TIMES IN EACH DIRECTION. RECORD AVERAGE DECELERATION TIME FOR EACH DIRECTION AS MEASURED BY STOP WATCH.

OPERATE STRUCTURE, WITH MANUAL CONTROL SET AT FULL SPEED, PAST THE SLOW DOWN LIMIT SWITCH OPERATING CAM AT EACH END OF TRAVEL NOT LESS THAN 5 TIMES FOR EACH POSITION. VERIFY THAT THE STRUCTURE AUTOMATICALLY OVERRIDES THE MANUAL SETTING AND DECELERATES TO INCHING SPEED. RECORD THE AVERAGE DECELERATION TIME FOR EACH DIRECTION AS MEASURED BY STOP WATCH. VERIFY THAT INCHING SPEED IS MAINTAINED REGARDLESS OF POSITION OF CONTROLLER AT ALL TIMES EXCEPT DURING ACTUAL DECELERATION PERIOD WHEN THE STRUCTURE IS WITHIN THE INCHING SPEED ZONE (I.E. BETWEEN THE SLOW DOWN CAM POSITION AND THE FINAL STOP CAM POSITION).

OPERATE THE STRUCTURE, OUT OF EACH SLOW DOWN ZONE NOT LESS THAN 5 TIMES, WITH THE MANUAL CONTROL SET FOR FULL SPEED, AND VERIFY THAT THE SYSTEM REVERTS TO MANUAL CONTROL UPON PASSING THE SLOW DOWN CAM AND AUTOMATICALLY ACCELERATES TO FULL SPEED. RECORD THE AVERAGE TIME FOR ACCELERATION AS DETERMINED BY STOP WATCH.

OPERATE STRUCTURE AT INCHING SPEED PAST EACH ANCHOR POSITION NOT LESS THAN 5 TIMES AND VERIFY THAT THE OVERTRAVEL LIMIT SWITCHES STOP THE STRUCTURE WITH NOT LESS THAN 3 INCHES NOR MORE THAN 4 INCHES TRAVEL BEYOND EACH ANCHOR POSITION. VERIFY THAT AFTER BEING STOPPED BY THE OVERTRAVEL LIMIT SWITCH, BY SIMPLY REVERSING THE MASTER CONTROL, THE STRUCTURE WILL MOVE AWAY FROM THE OVERTRAVEL STOP IN A NORMAL MANNER.

EMERGENCY OPERATION

DE-ENERGIZE CONTROLS CONNECTING TRACTION MOTORS ON DRIVE TRUCK NO. 1 AND DEMONSTRATE THAT THE STRUCTURE CAN BE MOVED USING ONLY DRIVE TRUCK NO. 2. REPEAT THIS OPERATION BY DE-ENERGIZING CONTROLS FOR DRIVE TRUCK NO. 2 AND DEMONSTRATING THAT THE STRUCTURE CAN BE MOVED USING ONLY DRIVE TRUCK NO. 1.

WITH THE STRUCTURE TRAVELING AT FULL SPEED, OPERATE THE EMERGENCY STOP BUTTON AND VERIFY THAT THE TRACTION CONTROL IS COMPLETELY DE-ENERGIZED AND THAT THE STRUCTURE IS BROUGHT TO A SAFE, SMOOTH AND POSITIVE STOP BY THE "FAIL-SAFE" ACTION OF THE MOTOR BRAKES ALONE.

MAXIMUM DUTY CYCLE

OPERATE THE STRUCTURE THROUGH THE MAXIMUM DUTY CYCLES SPECIFIED HEREINBEFORE TO DEMONSTRATE THE ABILITY OF THE TRACTION SYSTEM TO PERFORM AS SPECIFIED. IN THE EVENT THE WIND CONDITIONS AT THE TIME OF TEST ARE NOT SUFFICIENT TO LOAD THE TRACTION MOTORS TO THE SPECIFIED TORQUE VALUES, THE CONTRACTOR WILL BE PERMITTED TO CONDUCT THIS PART OF THE TEST ON ONE HALF OF THE SYSTEM AT A TIME WHILE INDEPENDANTLY CONTROLLING THE OTHER HALF OF THE TRACTION SYSTEM TO PROVIDE THE NECESSARY LOADING.

LOCKING WEDGES AND HURRICANE TIE-DOWN

POSITION DRIVE TRUCKS IN THE MATED POSITION AND INSERT LOCKING WEDGES. REMOVE LOCKING WEDGES.

POSITION DRIVE TRUCKS IN RETRACTED HURRICANE TIE-DOWN POSITION. JACK UP DRIVE TRUCKS AND INSERT LOCKING WEDGES TO VERIFY PROPER MATING OF TRUCKS WITH WEDGES. REMOVE WEDGES, LOWER JACKS AND INSERT JACKS IN NORMAL DAY-TO-DAY LOCKING POSITION.

---OPERATIONS AND MAINTENANCE---

---OPERATIONS AND MAINTENANCE INSTRUCTION MANUALS

THE CONTRACTOR SHALL PREPARE AND DELIVER TO THE CONTRACTING OFFICER SIX COPIES BOUND IN BOOK FORM AND IN ACCORDANCE WITH THE PROVISIONS OF "SPECIAL CONDITIONS."

EACH MANUAL SHALL CONTAIN THE FOLLOWING INSTRUCTIONS CLEARLY STATED AND SHALL INCLUDE DIAGRAMS AND ILLUSTRATIONS WHERE NECESSARY TO CLARIFY THE TEXT.

COMPLETE OPERATING INSTRUCTIONS INCLUDING:

INSPECTION AND CHECKS TO BE PERFORMED PRIOR TO OPERATION.

SPECIAL PRECAUTIONS AND OBSERVATIONS REQUIRED BEFORE AND DURING OPERATION.

OPERATIONS REQUIRED IMMEDIATELY PRIOR TO SHUT DOWN INCLUDING SPECIAL INSTRUCTIONS, IF ANY, TO BE FOLLOWED IF SYSTEM IS EXPECTED TO BE IDLE FOR 7 TO 30 DAYS, AND IF SYSTEM IS EXPECTED TO BE IDLE MORE THAN 30 DAYS.

SPECIAL PROCEDURES NECESSARY TO PREPARE THE SYSTEM FOR HURRICANE DUTY TOGETHER WITH SPECIAL PROVISIONS TO RESTORE TO NORMAL CONDITIONS AT TERMINATION OF HURRICANE ALERT INCLUDING SPECIAL INSPECTIONS AND/OR SERVICE.

DETAILED STEP-BY-STEP OPERATIONS FOR ROUTINE AND PERIODIC MAINTENANCE INSPECTIONS AND OPERATIONS INCLUDING FREQUENCY OF INSPECTIONS, FREQUENCY OF LUBRICATION AND FREQUENCY OF OPERATION FOR EXERCISE PURPOSES AND TESTING.

COMPLETE MAINTENANCE INSTRUCTIONS INCLUDING:

MAXIMUM PERMISSIBLE AND NORMAL VOLTAGE DROPS ACROSS ALL COMPONENTS.

MAXIMUM AND NORMAL CURRENT VALUES IN ALL CIRCUITS.

LIMITS OF ADJUSTMENT OF ALL ADJUSTABLE COMPONENTS.

DETAILED SEQUENCE OF OPERATIONS FOR PERFORMING ADJUSTMENTS.

COMPLETE DETAILED INSTRUCTIONS FOR REMOVAL, OVERHAUL AND RECONDITIONING, AND REINSTALLATION OF ALL COMPONENTS.

DETAILED PROCEDURES FOR CLEANING, INSPECTING, PREPARING THE SYSTEM FOR OPERATION FOLLOWING MAINTENANCE OPERATIONS.

CHARTS AND DIAGRAMS:

MULTIPLE COPIES OF ELECTRICAL CIRCUIT DIAGRAMS FOR EACH INDIVIDUAL CIRCUIT WITH ONE COPY OF EACH DIAGRAM COLOR CODED AND MARKED WITH APPROPRIATE SYMBOLS AND NOTES TO INDICATE CURRENT AND VOLTAGE FOR ALL CIRCUITS DURING EACH PHASE OF THE COMPLETE CYCLE OF OPERATION.

COMPLETE ELECTRICAL CIRCUIT DIAGRAM SHOWING ALL COMPONENTS BY APPROPRIATE STANDARDIZED ELECTRICAL SYMBOLS AND LEGEND TOGETHER WITH A DESCRIPTION OF EACH COMPONENT AND ITS FUNCTION IN THE CIRCUIT.

COMPLETE TROUBLE SHOOTING CHART BY INDIVIDUAL TYPICAL ELECTRICAL CIRCUITS SHOWING MALFUNCTIONS IDENTIFIED BY VISIBLE SYMPTOMS TOGETHER WITH THE POSSIBLE CAUSES LISTED IN ORDER OF EXPECTED PROBABILITY, AND THE REMEDIAL ACTION FOR EACH CAUSE OF MALFUNCTION.

SPARE PART LISTS AND SPECIAL TOOL REQUIREMENTS INCLUDING:

DETAILED LISTS OF SPARE PARTS FOR MAINTENANCE AND OVERHAUL OF EACH COMPONENT INCLUDING ILLUSTRATIONS AND EXPLODED VIEWS WHERE NECESSARY TO INSURE PROPER IDENTIFICATION OF THE INDIVIDUAL PARTS.

COMPLETE PROCUREMENT SPECIFICATIONS AND SOURCE OF SUPPLY FOR ALL EXPENDABLE MATERIALS INCLUDING LUBRICANTS, OIL SEALS, ETC.

COMPLETE AND DETAILED TABULATION SHOWING ALL VALUES OF VOLTAGES, CURRENT, AND ALL OTHER ADJUSTMENTS AS RECORDED DURING FINAL TEST, ADJUSTMENT AND CALIBRATION OF THE SYSTEM.

---MAINTENANCE AND INSTRUCTION PERSONNEL

UPON COMPLETION AND FINAL ACCEPTANCE OF THE SYSTEMS, THE CONTRACTOR SHALL PROVIDE AN EMPLOYEE OF THE DRIVE TRUCK SUBCONTRACTOR FAMILIAR AND EXPERIENCED WITH THE PARTICULAR SYSTEMS, AND WHO ASSISTED IN THE CHECK-OUT AND TESTING OF THE SYSTEM PRIOR TO FINAL ACCEPTANCE, FOR THE PURPOSE OF TROUBLE SHOOTING, EXPEDITING MAINTENANCE AND TO HAVE OVER-ALL RESPONSIBILITY FOR THE OPERATION OF THE SYSTEM UNTIL COMPLETION OF THE OVER-ALL CONTRACT AS OUTLINED IN "CONTRACT SCHEDULE." SERVICES OF THE INDIVIDUAL WILL BE REQUIRED AT THE CONSTRUCTION SITE FOR EIGHT HOURS PER DAY, FIVE DAYS PER WEEK, UNTIL COMPLETION OF THE OVERALL CONTRACT AS OUTLINED IN "[illegible] OF SCHEDULE." INDIVIDUAL SHALL ALSO BE REQUIRED TO INSTRUCT GOVERNMENT PERSONNEL IN THE PROPER [illegible] AND MAINTENANCE OF THE INSTALLED SYSTEMS.