TECHNICAL SPECIFICATIONS

THREE PHASE NETWORK SUBWAY (SUBMERSIBLE) TRANSFORMERS

TRANS001 & TRANS002

I. GENERAL

I.1. This specification covers three phase subway transformers used in a network system. The transformers described by this specification are intended for use on low-voltage network systems, and must be designed to operate in parallel. The primary supply is provided by an underground 13.2 kV Delta connected, 60 hertz, distribution system. They shall be compatible with JEA approved Protectors.

I.2. Transformers supplied under this specification shall meet the requirements of the latest revision of the following list of standards and guides established for distribution transformers except where they conflict with JEA specifications, in which case JEA specifications shall apply.
AMERICAN STANDARD TESTING OF MATERIALS (ASTM)
AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
CODE OF FEDERAL REGULATIONS (EPA)
EDISON ELECTRIC INSTITUTE (EEI)
FEDERAL LAWS "RCRA" AND "CERCLA" FOR HAZARDOUS WASTE INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERING (IEEE)
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION (NEMA)
SOUTHEASTERN ELECTRIC EXCHANGE (SEE)

I.3. ENVIRONMENTAL ACCEPTABILITY

I.3.1. Transformers will be environmentally acceptable and, as of the date of manufacture, shall comply with all laws in effect, pertaining to hazardous chemicals.

I.3.2. No dielectric fluid shall contain commercial chemical products which would be regulated as hazardous waste as defined in list 40 CFR 261 if disposed, or if released into the environment. Nor shall the dielectric fluid contain chemicals in excess of their reportable quantities if released into the environment, according to 40 CFR 302. Finally, a Material Safety Data Sheet shall be provided for any dielectric fluids used in transformers. Upon request, the manufacturer must certify that no transformer contains dielectric fluid with a Polychlorinated Biphenyl concentration in excess of one part per million (1 ppm). Such certification that the dielectric contains less than 1 ppm shall be verified.

I.4. TECHNICAL INQUIRIES

Bidder's questions may be communicated by telephone. All such questions must be confirmed in writing. If further explanation is deemed necessary, the buyer will notify each bidder by addendum to these IFB documents.

Any inquiry relating to the Technical Specifications of this IFB shall be directed to the technical evaluator:

JEA
Distribution Electric Standards
225 N Pearl St
Jacksonville, Florida 32202
Trevor Parker: parkta@jea.com Kris Rosenhauer: rosekk@jea.com

II. APPROVED MANUFACTURERS

A listing of APPROVED MANUFACTURERS for each specific Distribution Transformer ITEM ID is shown in the JEA “Master Material Catalog – Electric” on jea.com at the following URL.
https://apps.jea.com/MaterialsCatalog/emmc.pdf
Bidders may sub-contract work to any of these Manufacturers for said ITEM ID’s.

III. AMORPHOUS CORE TRANSFORMERS

Amorphous core transformers are not acceptable.

IV. MATERIAL

Incoming material shall be inspected by qualified Quality Control Personnel. Material such as transformer oil, primary and secondary conductor, insulation materials, gasket material and core steel shall be checked and tested at regular intervals to insure that quality is uniform throughout and has not deteriorated during storage. Oil compatibility test results will be made available to JEA upon request. New material or design changes, or transformer components, such as bushings, bayonets, latching devices, paint systems, or brackets shall be submitted to JEA for approval prior to inclusion in manufacturing.

IV.1. REPAIR PARTS

A parts list will be furnished, upon request, for repair equipment. Lists will cover items such as bayonets, gaskets, bushings, tap changers, etc.

IV.2. ELIGIBILITY OF MATERIAL

IV.2.1. Manufacturers and catalog numbers listed in the latest revision of the JEA “Master Material Catalog – Electric” or described in the technical portion of this specification may be bid.

IV.2.2. All reasonable efforts will be made by the JEA to eliminate errors in the aforementioned master material catalog which might result in a bidder bidding an item eventually ruled unacceptable by JEA, but such possible occurrence shall not become the basis for any claim for damage or loss.

IV.2.3. All Bidders are hereby advised to bid the item in accordance with the supplied technical data within this IFB. The "Brief Description" entered on the Bid Form is used as a reference tool to locate that particular item within the technical specifications and should in no way be used as the basis of pricing.

IV.2.4. Bids submitted by vendors for unapproved manufacturers, or unapproved catalog numbers of approved manufacturers will not be evaluated.

IV.2.5. Bidding and/or supplying products in the past not listed on the JEA master material catalog does not constitute approval.

IV.3. TRANSFORMER OIL

Transformer oil can be Mineral Oil, FR3, or other Oil approved by JEA Design and Material Standards in advance of the bid opening.

V. WARRANTY

JEA will pay no freight charges on warranty transformers. Warranty will be one year from date of installation or eighteen months from date of delivery, whichever comes first.

VI. COMPLIANCE WITH SPECIFICATIONS

If a discrepancy exists between the bid description and the approved technical data, the approved technical data will be the deciding and binding factor as to the exact item required. It will be the Contractor's responsibility to accept all additional expenses incurred for correcting material not bid in accordance with Section VI, Technical Specifications.

VII. SUBMITTAL REQUIREMENTS

VII.1. THE FOLLOWING INFORMATION MUST BE PROVIDED AND APPROVED PRIOR TO BID OPENING.

The Technical Specifications Part A through Part I list approved manufacturer catalog numbers for various components, consisting of but not limited to, primary and secondary bushings, primary bushing inserts, secondary connectors or kits, ground lugs, lightning arresters, tap changers, weak links, clip fuses and bayonets. **All alternate manufacturers or catalog numbers must be approved by the Technical Standards Representative prior to bid opening.**

VII.2. THE FOLLOWING INFORMATION MUST BE PROVIDED WITH THE BID:

Manufacturer must supply total winding loss as defined by ANSI which includes stray losses for bid evaluation, and must list impedance and efficiency in the columns provided. Data shall be guaranteed for all transformers subject to tolerance stated in ANSI Standard C57.12.00, Table 16.

VII.2.1. No Load Loss in kW at 50% loading & 85º C.

VII.2.2. Load Loss in kW at 50% loading & 85º C.

VII.3. Manufacturer must submit one copy of shop drawings, catalog details and/or other submittals as required by the Technical Specifications for individual bid items within 30 days after receipt of an Award for approval to:

JEA
Distribution Electric Standards
225 N Pearl St
Jacksonville, Florida 32202
Trevor Parker: parkta@jea.com Kris Rosenhauer: rosekk@jea.com

VII.4. Submitted shop drawings and all other submittals will be reviewed and one copy will be returned marked either approved or resubmit. If shop drawings are marked resubmit, make corrections as shown and resubmit for approval. Cover letter must reference each ITEM ID. No Purchase Order shall be issued until Shop Drawings have been approved by JEA. No material shall be shipped until approved shop drawings have been received by the manufacturer.

VII.5. Shop Drawings from the Successful Bidder shall include Dimensions and designed fusing for Each Item ID as well as Manufacturers' Catalog Numbers for items identified in paragraph 7.1 above.

VII.6. Shop Drawings from the Successful Bidder shall include the information as seen on an Excel Spreadsheet shown on page 11 of 11 (blank to be provided by JEA).

VIII. COMPONENTS

All components shall be installed in accordance with component manufacturers' instructions.

IX. RATING

The primary voltage, secondary voltage, BIL and KVA ratings shall be as follows:

TRANSFORMER RATINGS

ITEM ID	KVA SIZES	PRIMARY VOLTAGE	SECONDARY VOLTAGE	BIL (KV)
TRANS001	500	13200 Delta	216Y/125	95
TRANS002	750	13200 Delta	216Y/125	95

X. CORE-COIL CONSTRUCTION

X.1. Coils shall be designed for 55^{O}C rise as defined in ANSI-C57.12.40, at rated KVA and secondary voltage with the ambient no more than 30^{O}C.

X.2. The transformer core shall be constructed of high permeability, silicon steel laminations designed to keep losses and eddy currents at a minimum. Core and coil assembly shall be supported with mechanical bracing to withstand full short circuit forces as limited only by the impedance of the transformer.

X.3. Voltage adjustment shall be by means of an external tap changer on the high voltage coils. Tap changers will have two positions above and below nominal voltage of 2-2.5% each for a total range of 10%. The tap changer handle shall extrude through the top cover without disturbing the integrity of the tank seal. The changer handle shall be placed under a cap of adequate size.

X.4. The low voltage neutral shall be brought out to a 4 hole NEMA spade solidly grounded to the case. A stainless steel ground pad shall be provided on the top and bottom of the case, in accordance with ANSI C57.12.40 Figure 9.

XI. DIELECTRIC

The insulating fluid shall be Dow 561 silicon or equivalent. Silicon fluid is required throughout including the cable entrance chamber. Specifications indicating such are required with the bid if other than Dow 561 is used.

XII. TRANSFORMER TANK CONSTRUCTION

XII.1. The transformer tank shall be Stainless steel construction and be free of rust, welding slag or splatter and other contamination before entering the painting process. The enclosures, hinges, door handles, and all hardware shall be 409, 304L or 400CB stainless steel. All handhole covers shall be welded into place. The cooling radiators shall be 5/16" panels for subway applications. Completed transformer fully assembled with switch and network protector must be able to be lowered through a 48" X 102" opening.

XII.2. NAMEPLATE

XII.2.1. A durable aluminum or stainless steel nameplate shall be affixed on each transformer tank and shall bear the minimum information specified in Table 9, nameplate A and B, of ANSI C57.12.00 where applicable. The nameplate for all oil filled transformers must state they certify "NON-PCB" dielectric.

XII.2.2. Each nameplate shall state the month and year of manufacture.

XII.2.3. Indication of a mild steel or stainless steel tank shall be stamped on the nameplate by either MS (mild steel) or SS (stainless steel). Also, the grade shall be stated. (Example 404 SS, 304L SS and etc.).

XII.2.4. Nameplates shall include bar coding information. The information shall be in accordance with EEI and consist of the manufacturer's identification, transformer serial number and JEA item identification number.

XII.3. The tank shall be designed for jacking, rolling or sliding the complete unit from the bottom in either direction. Lifting eyes shall be provided to lift unit from the top.

XIII. TRANSFORMER PAINTING

The transformer shall be shotblasted and treated with appropriate chemicals to prevent corrosion and to insure a good bond with the primer. The primer shall be a zinc rich epoxy followed by an epoxy top coat. Technical data and test reports must accompany the bid.

XIV. ACCESSORY EQUIPMENT

In addition to the standard accessory equipment described in ANSI-C57.12.40, the following items are to be included.

XIV.1. TRANSFORMER ACCESSORIES

The transformer shall have the following as standard accessory and it shall be installed at the factory:

Liquid Level Gauge, welded into place
Pressure Relief Device, Qualitrol 20860E mounted on welded handhole with 1/2" stainless hardware. Automatic pressure relief valve or equivalent system designed to open at a minimum of 50 SCFM @ 15 psi.
A temperature gage with well and temperature sweep hand to record highest temperature reached since reset will be included with alarm contacts.

XIV.2. HIGH VOLTAGE SWITCH

XIV.2.1. A 3 position high voltage switch shall be supplied as described in ANSI-C57.12.40. The switch shall have stainless or bronze position indicators. When moving the switch from open to ground or ground to open position, a pause will allow the electrical interlock to engage if the transformer is energized. The switch shall be equipped with an encapsulated interlock so contaminants will not enter in the event of a transformer failure.

XIV.2.2. The high voltage terminal chamber shall be as described in ANSI-C57.12.40. It shall be fitted with three welded high voltage bushings 600 amp 125 kV BIL Elastimold K650T1 C/W Elastimold stud #650SA (on top of chamber). Each high voltage bushing shall have a Stainless Steel parking stand adjacent to bushing. Dust covers shall also be installed.

XIV.3. SAFETY LABELS

Safety labels shall consist of decals and/or painted stencils. Bilingual (English/Spanish) Warning and Danger labels will be attached to individual cabinets. Labels shall be applied such that no air bubbles will form to cause brittleness and cracking. The manufacturer shall provide, and attach to the transformer, operation warning decals for the following equipment (but not limited to); tap changers, pressure relief devices, switches and bayonet fuses. These warning labels are in addition to specific labels required in the various technical specifications.

XIV.4. PCB LABELS

All transformers containing dielectric fluid shall have a Non-PCB label on the outside front center visible to the public with letters not less than one inch high.

XIV.5. TAP CHANGER

Tap changers will be furnished on all transformers. Tap changers will have two positions above and below nominal voltage of 2-2.5% each for a total range of 10%. Internal tap changers with external tap changer operator shall be underneath a pipe cap to protect the operator from corrosion when submerged. Tap

changers shall have a positive “Snap Action” or “Cam Action” operation. Manufacturer may supply any of the following approved manufacturer's tap changer switch.

Central Moloney
Cooper Power Systems
ABB

XIV.6. LOW VOLTAGE COMPARTMENT

XIV.6.1. The low voltage transition compartment shall be designed to interface the transformer and a network protector (provided by JEA). The low voltage throat shall be built as shown in ANSI-C57.12.40 for the protector interface. The throat will be required to support the full weight of the protector.

XIV.6.2. Flexible copper bus leads, as shown in ANSI-C57.12.40, shall be provided with the transformer for protector hookup. The low voltage bushing shall be bolted bushings. The protector gasket shall be provided. A shipping guard shall be supplied over the low voltage bushings. The protector throat shall be 47-3/4” from the centerline of the throat to the floor for 500 KVA units and 48-3/4” for 750 KVA units.

XV. PUBLICATIONS

An instruction book which contains information on the assembly, operation, maintenance and storage of the transformer and all accessory equipment shall be shipped with every unit. A parts list shall also be included upon request.

XVI. POLARITY AND MARKING OF TERMINALS

The polarity and terminal marking of this transformer shall be according to ANSI Standards, C57.12.40.

XVII. FINAL TESTING AND INSPECTION

XVII.1. QUALITY INSPECTION

XVII.1.1. Good quality control shall be exercised at all times to insure completed transformer meets guaranteed losses. Manufacturers shall have in place: engineering product specifications on all parts, assemblies, and finished products; manufacturing product instructions defining how each part is to be made and tested; and documentation of the essential quality characteristics and how each is measured. Such non-proprietary information shall be made available to JEA when requested.

XVII.1.2. Transformers shall receive a final quality inspection before shipping with special attention to oil leaks at bushings, welds, chips and scratches to finish, decals and add on accessories.

XVII.2. TESTING

XVII.2.1. Testing shall be per the Federal Register, Part III, Department of Energy, 10 CFR Part 431, Energy conservation Program for Commercial Equipment: Distribution Transformers Energy conservation Standards; Final Rule, Friday , October 12, 2007 “Final Rule”.

XVII.2.2. Method of testing shall be as per ANSI Standards for distribution transformers C57.12.40. One hundred percent of transformers leaving production line shall have been tested for the following:

A) Polarity
B) Ratio – on all taps
C) Load Losses (or Winding Losses) at 100% loading
D) No Load Losses (or Core Losses) at 100% loading
E) Dielectric - Induced and Applied Potential. Refer to ANSI Standards for specific units.
F) Pressure on tanks - All tanks shall be tested in such a manner to positively indicate leaks. (Manufacture shall provide a copy of the testing procedure).

G) Impulse - All transformers shall receive and pass at least one full wave production line impulse test at one hundred percent of rated BIL. The impulse test shall be on 100% of all transformers.

XVII.2.3. Sample or prototype transformers of each class and each KVA size shall be tested for:

A) Short Circuit - Classifications used by JEA shall be able to withstand testing in accordance with ANSI C57.12.90.
B) Radio Interference
C) Stray Loss (calculated)
D) Life Test on Components
E) Exciting Current
F) Impedance
G) Power Factor – limited to 1% according to Doble testing procedures

XVII.2.4. Transformers shall be supplied with a maximum power factor of 1% according to Doble testing procedures.

XVII.3. Three certified copies of final test results shall be supplied with each transformer. The report is to be E-mailed to JEA. JEA to supply address upon award of contract and changes as necessary.

XVII.3.1. Each test report must be e-mailed to JEA within 30 days after each shipment and include the following data:

JEA to supply e-mail address upon award of contract.

A) Customer: JEA
B) JEA Purchase Order Number
C) Quantity Ordered
D) JEA IFB number
E) Bid item number
F) Core Loss of each transformer
G) Average core loss of all transformers on report
H) Winding Loss of each transformer
I) Average winding loss of all transformers on report
J) Impulse Test Statement.
K) KVA size
L) Primary voltage
M) Secondary voltage
N) Impedance

XVII.4. Transformer manufacturers shall supply final testing schedule to JEA three weeks prior to testing so that arrangements can be made to witness the testing by JEA personnel.

XVIII. TEST REPORT SUBMITTALS

Transformer suppliers, manufacturers, and/or representatives must submit transformer test reports on all transformers shipped. The report is to be E-mailed to JEA. JEA to supply address upon award of contract and changes as necessary.

XVIII.1. Each test report must be submitted within 30 days after each shipment to the Supervisor of the Test Facility and include the following data:

A) Customer: JEA
B) JEA Purchase Order Number
C) Quantity Ordered
D) JEA IFB number
E) Bid item number
F) Core Loss of each transformer

G) Average core loss of all transformers on report
H) Winding Loss of each transformer
I) Average winding loss of all transformers on report
J) Impulse Test Statement.
K) KVA size
L) Primary voltage
M) Secondary voltage
N) Impedance

XIX. LOSS SUMMARY REPORT

XIX.1. A LOSS SUMMARY REPORT (following) must be used and certified by the Manufacturer covering all transformers shipped annually during the term of the Contract. This form must be submitted within 30 days after the last transformer shipment each year to:

JEA
Distribution Electric Standards
225 N Pearl St
Jacksonville, Florida 32202
Trevor Parker: parkta@jea.com Kris Rosenhauer: rosekk@jea.com

NOTES: 1. No Other test reports are required at this address.

2. P.O. Numbers are not required on the final summary report.

XIX.2. It is JEA's expectation that the manufacturer shall meet the quoted losses throughout the term of the contract. JEA will accept for delivery transformers which meet the losses quoted in the bid form plus/minus the material tolerances allowed by ANSI. Each manufacturer is required to submit annually a Final Summary Report. The average load and no load losses for all transformers shipped shall meet the quantities quoted plus one percent. JEA reserves the right to charge the manufacturer for excess losses.

XX. TRANSFORMER EFFICIENCY REQUIREMENTS

The transformers supplied under this specification shall meet the minimum transformer efficiencies, as described by the Federal Register, Part III, Department of Energy, 10 CFR Part 431, Energy conservation Program for

Commercial Equipment: Distribution Transformers Energy conservation Standards; Final Rule, Friday , October 12, 2007 “Final Rule”.

XX.1. TABLE I.1. – STANDARD LEVELS FOR LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS IS SHOWN BELOW FOR INFORMATION PURPOSES.

Three Phase

kVA	Efficiency
500	99.25
750	99.32

Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE test procedure. 10 CFR Part 431, Sub-part K, Appendix A.

XXI. ANNUAL TRAINING

Each manufacturer that receives an award under this Contract shall be required to provide annually a one day seminar on transformers to JEA personnel at JEA’s facility. The seminar shall be at no additional cost to JEA.

XXII. DELIVERY

XXII.1. A thick, plastic, heat shrink wrap ultraviolet resistant cover shall be provided over the entire unit for protection during normal handling and shipping.

XXII.2. Flex buss, spare parts and any other material not attached will be packaged in separate crates or boxes and shall be shipped with each transformer on the same pallet.

MANUFACTURER

TRANSFORMER TEST REPORT SHEET

LOSS SUMMARY REPORT

FOR

JEA IFB NO. _____

BID ITEM NO.	JEA ITEM ID	TOTAL QTY* ORDERED	AVERAGE* CORE LOSS	AVERAGE* WINDING LOSS

* FOR THE 12 MONTH PERIOD

MANUFACTURER NAME: _____

CERTIFIED BY: _____ DATE: _____

Field Name	Description	Typical Data (Examples shown below)
ITEM ID	JEA ITEM ID	TRACG001
INDEX	file index number (not user assigned)	
TYPE	Transformer Type POLE=Poletype RPAD=1PH Padmount CPAD=3PH Padmount VAULT=3PH Vault type	POLE
PRI	Primary Voltage Description	14760/25565Y
SEC	Secondary Voltage Description	120/240
KVA	kVA Rating	10
MFG	Manufacturer Code	XYZ
CATID	Catalog/Part Number	
FEATURES	Construction Features	1HV CONV
TAPS	Taps Y=Yes N=No	N
FUSE	Fuse - Series Winding	NA
FUSE2	Fuse - Parallel Winding (if DV)	NA
FUSELINK	Fuselink (bayonet)	NA
FUSELINK2	Fuselink - Parallel Winding (if DV)	NA
COST	Delivered Price	$ 477.00
NL	No Load Losses - watts @ 20deg C	74
LL	Load Losses - watts @ 85deg C	379
AUX	Auxiliery watts (fans/pumps/etc…)	0.00
IZ	%Impedance	1.82
IEX	%Exciting Current	1.00
TStray	Total Stray Losses	0.00
Eddy	Eddy Losses	0.00
AWR	Average Winding Rise - Deg C	56.50
TOR	Top Oil Rise - Deg C	45.00
HSG	Hottest Spot Gradient - Deg C	18.30
TOTC	Top Oil Time Constant (hours)	2.40
HSTC	Hottest Spot Time Constant (minutes)	10.00
N	Top Oil Exponent - p.u.	0.80
M	Hot Spot Exponent - p.u.	0.80
TOTWT	Total Weight (lbs)	353.00
INTW	Interior (Core&Coil) Weight (lbs)	171.20
TKWT	Tank and Fittings Weight (lbs)	59.30
FLUID TYPE	Type of dielectric Fluid	MINERAL OIL
FLUID	Fluid Gallons	12.90
HVCM	Primary Winding Conductor Material (CU/AL)	CU
HVCW	Primary Winding Conductor Weight (lbs)	22.50
LVCM	Seconday Winding Conductor Material (CU/AL)	AL
LVCW	Secondary Winding Conductor Weight (lbs)	12.90
COREWT	Core Weight (lbs)	128.72
TKHT	Tank Height (inches)	27.80
TKWD	Tank Width (inches) - or Diameter if Round	15.00
TKDP	Tank Depth (inches)	0.00
AIRSPACE	Air Space above Oil (inches)	0.00
ADIM	Total (overall) Height (inches)	37.90
BDIM	Total (overall) Width (inches)	20.70
CDIM	Total (overall) Depth (inches)	22.80
COMMENT	Manufacture comments	

REVISION HISTORY

Date	Description	Author of Change
1/05/18	Updated contact info on pg. 1 under General, Technical Inquiries I.2.	PARKTA
1/05/18	Amorphous Cores are no longer Accepted, change made in III. Pg. 2	PARKTA
1/05/18	Updated info under VII.3. pg.3	PARKTA
1/05/18	Removed amorphous core reference in XII.2.2 pg.4	PARKTA
1/05/18	XVII.2.2.E pg.6 no longer makes a reference to Pad mounted units.	PARKTA
1/05/18	Added Adjustments page	PARKTA
1/05/18	XII.1 pg.4, All tanks, enclosures, hinges, handles, hardware, and tanks shall now be welded 409, 304L, 400CB stainless steel	PARKTA
05/25/23	Updated Revision History	PARKTA
05/25/23	Updated Header/Footer	PARKTA
07/02/24	Changed HQ location in section VII.3 on pg.3 and XIX.1 on pg.8	PARKTA
8/11/25	Updated HQ location and added Email direct contacts, 3 different locations	PARKTA