

CenterPoint Energy SPECIFICATION FOR CUSTOMER 138 KV SUBSTATION DESIGN

- 17.1.6.2. Coat all connections on battery terminals with no-oxide grease.
- 17.1.6.3. Tin all copper connections to battery terminal.
- 17.1.6.4. Install, connect and adjust charger per manufacturer's instructions.
- 17.1.6.5. Put batteries on equalize charge until the specific gravity of all cells is within the limits set by manufacturer.
- 17.1.6.6. Read and record the float voltage and specific gravity of each cell.

18. RECOMMENDED TESTS AND INSPECTIONS

18.1. During installation but prior to energizing the equipment, CenterPoint Energy recommends that the customer perform the following tests and inspections as a minimum. List is not considered to be exhaustive or all-inclusive.

- 18.1.1. For low side equipment, test relays, check transformer and bus automatic reclosing and check operation of flags when tripping through the panel with current.

Note: CenterPoint Energy will check high side relays, 138 kV transmission line protective relays and 138 kV circuit breaker automatic reclosing.

18.1.2. ALL SUBSTATION EQUIPMENT:

- 18.1.2.1. Clean rusted surfaces, prime all bare metal surfaces and touch up with paint matching the finish coat.

18.1.3. CONTROL WORK:

- 18.1.3.1. Wire check all cables to CT's and perform insulation resistance test ("meggar") of cables.
- 18.1.3.2. In the following order:
 - 18.1.3.2.1. Polarity check CT's.
 - 18.1.3.2.2. Ratio check CT's.
 - 18.1.3.2.3. Excitation test CT's.
 - 18.1.3.2.4. Insulation resistance test ("meggar") CT's.

- 18.1.3.3. Check cable connections to panels.

- 18.1.3.4. Wires check panels.

18.1.4. SWITCHGEAR:

- 18.1.4.1. Check bus work for continuity, phase sequence and adequate clearance.
- 18.1.4.2. Check all bolted bus connections.

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- 18.1.4.3. High-pot cable with 25 kV DC.
- 18.1.4.4. Insure that all exposed bus work is properly insulated.
- 18.1.4.5. Bridge all bus work.
- 18.1.4.6. Perform dielectric insulation and power factor tests on all bus work.
- 18.1.4.7. Check breaker-lifting devices for alignment and adjust limit switches, if necessary.
- 18.1.4.8. Adjust auxiliary and cell switches.
- 18.1.4.9. Check continuity for all AC, DC control and CT circuits.

18.1.5. TRANSFORMERS:

- 18.1.5.1. Visually inspect for internal shipping damage and check all internal connections.
 - 18.1.5.2. Install bushing and accessories per manufacturer's instructions.
 - 18.1.5.3. Inspect LTC compartment and adjust per manufacturer's instruction and check LTC operation.
 - 18.1.5.4. Bridge primary and secondary windings on all tap positions.
 - 18.1.5.5. Ratio check, excitation test, perform insulation resistance test ("meggar") and check polarity on all CT's. Leave unused CT's shorted and grounded on the secondary.
 - 18.1.5.6. Vacuum fill per manufacturer's instructions.
 - 18.1.5.7. Check for oil and gas leaks. (This may be done prior to vacuum filling).
 - 18.1.5.8. Test oil before and after filling. (Maximum power factor, minimum dielectric strength, color, acidity and interfacial tension).
 - 18.1.5.9. Test oil for dissolved combustible gas and moisture content.
- Note: This test is to be performed 24 to 48 hours after the substation has been energized and periodically thereafter.
- 18.1.5.10. Check voltage regulating relay and controls.
 - 18.1.5.11. Check cooling equipment and controls.
 - 18.1.5.12. Check nitrogen-regulating equipment and adjust per manufacturer's instructions.
 - 18.1.5.13. Check sudden pressure relay and associated circuits.
 - 18.1.5.14. Check and connect desired alarm circuits.

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- 18.1.5.15. Perform insulation resistance test ("meggar") and insulation power factor test of bushing and windings.
- 18.1.5.16. Check all bushings to bus connections.
- 18.1.5.17. Check all CT's and control circuit connections.
- 18.1.5.18. Record all measurements and readings.
- 18.1.5.19. Check Core Ground.

REFERENCE DRAWINGS

<u>Rev</u>	<u>Date</u>	<u>Items Revised</u>	<u>Specification No.</u>	<u>Page</u>	<u>File</u>
14	7-22-2005	4000A and other updates	007-231-14	26	CNP_007-231-14rev14_7-22-2005 Addendum 5-8-2006.doc



CenterPoint Energy SPECIFICATION FOR CUSTOMER 138 KV SUBSTATION DESIGN

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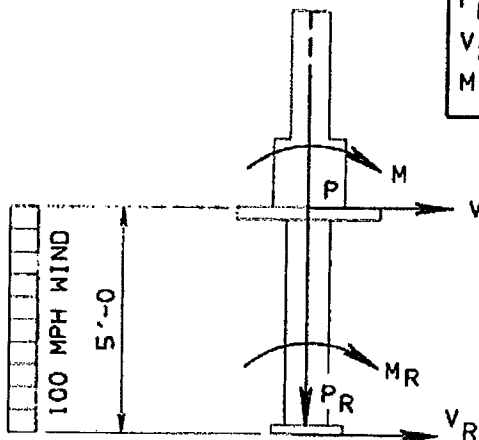
DESIGN CONDITIONS:

1. LIMIT INSTRUMENT MOUNTING BOLT SPACING TO NO LESS THAN 15" CENTER TO CENTER.
2. SHOULD NOT EXCEED THESE VALUES:

P = 2.5 KIPS
V = 0.7 KIPS
M = 44.3 INCH KIPS

FOUNDATION LOADS

$P_R = 2.8$ KIPS
 $V_R = 1.1$ KIPS
 $M_R = 100.0$ INCH KIPS



NOTE:

CUSTOMER MUST MAINTAIN ALL NESC PHASE TO GROUND AND PHASE TO PHASE CLEARANCES.

5'-0 HEIGHT

DESIGN CRITERIA
138KV STANDARD
INSTRUMENT TRANSFORMER STAND
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

Drawn 1-24-94	REK	Scale NTS
Checked 1-24-94	REK	Scale 1/8" = 1'-0"
Conc'd		DATE 1/24/94
Approved		17119006

NO.	REV.	DATE	REVISION	BY	CHK	APP

Rev 14 Date 7-22-2005 Items Revised 4000A and other updates

Specification No. 007-231-14

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File

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CenterPoint Energy SPECIFICATION FOR CUSTOMER 138 KV SUBSTATION DESIGN

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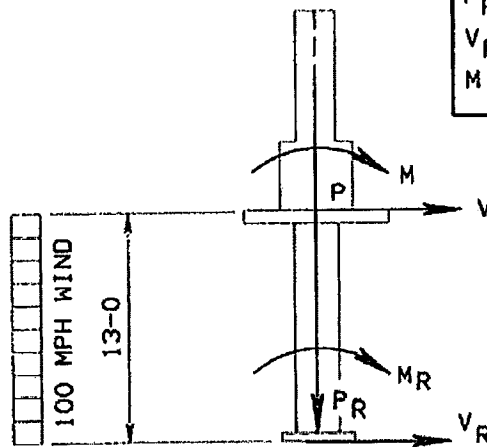
DESIGN CONDITIONS:

1. LIMIT INSTRUMENT MOUNTING BOLT SPACING TO NO LESS THAN 15" CENTER TO CENTER.
2. SHOULD NOT EXCEED THESE VALUES:

P = 2.5 KIPS
V = 0.8 KIPS
M = 50.0 INCH KIPS

FOUNDATION LOADS

$P_R = 3.1$ KIPS
 $V_R = 1.8$ KIPS
 $M_R = 253.0$ INCH KIPS



NOTE:

CUSTOMER MUST MAINTAIN ALL NESC PHASE TO GROUND AND PHASE TO PHASE CLEARANCES.

13'-0 HEIGHT

DESIGN CRITERIA

138KV STANDARD
INSTRUMENT TRANSFORMER STAND
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS

DATE: 1-24-94	REK	CHK: NTS
DATE: 1-24-94	REK	CHK: 2 of 4 pages
DATE: 1-24-94	REK	CHK: 1 of 4 pages
DATE: 1-24-94	REK	CHK: 1 of 4 pages

NO	DATE	JOB NO	AS-1310A	BY	EN	ISA	APP
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Rev 14 Date 7-22-2005 Items Revised 4000A and other updates

Specification No. 007-231-14

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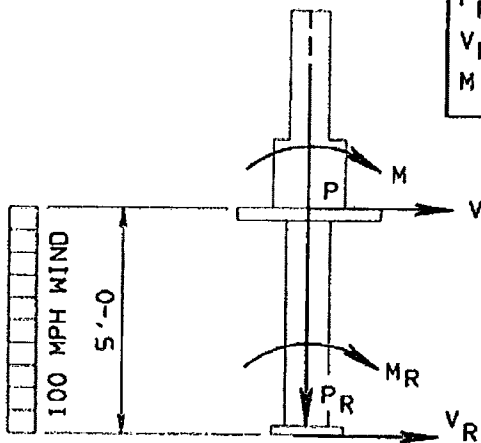
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DESIGN CONDITIONS:

1. LIMIT INSTRUMENT MOUNTING BOLT SPACING TO NO LESS THAN 15" CENTER TO CENTER.
2. SHOULD NOT EXCEED THESE VALUES:
 $P = 4.7$ KIPS
 $V = 0.9$ KIPS
 $M = 66.0$ INCH KIPS

FOUNDATION LOADS

$P_R = 5.0$ KIPS
 $V_R = 1.3$ KIPS
 $M_R = 130.0$ INCH KIPS



NOTE:

CUSTOMER MUST MAINTAIN ALL NESC PHASE TO GROUND AND PHASE TO PHASE CLEARANCES.

**5'-0 HEIGHT
HEAVY DUTY**

**DESIGN CRITERIA
138KV STANDARD
INSTRUMENT TRANSFORMER STAND
CENTERPOINT ENERGY, INC.
HOUSTON, TEXAS**

DESIGN 1-24-94	REK	SCALE NTS
REVISION 1-24-94	REK	SHEET 2 OF 4 SHEETS
CHECKED		DATE
APPROVED		171190 06

NO.	DATE	REV. NO.	DESCRIPTION	BY	CHK	APP
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CenterPoint Energy SPECIFICATION FOR CUSTOMER 138 KV SUBSTATION DESIGN

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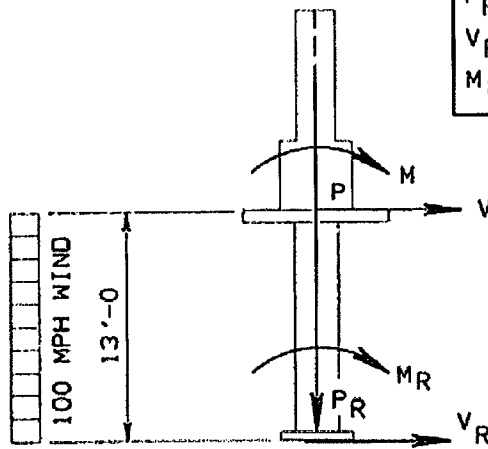
DESIGN CONDITIONS:

1. LIMIT INSTRUMENT MOUNTING BOLT SPACING TO NO LESS THAN 15" CENTER TO CENTER.
2. SHOULD NOT EXCEED THESE VALUES:

P = 4.7 KIPS
V = 1.0 KIPS
M = 74.0 INCH KIPS

FOUNDATION LOADS

P_R = 5.4 KIPS
V_R = 2.0 KIPS
M_R = 307.0 INCH KIPS



NOTE:

CUSTOMER MUST MAINTAIN ALL NESC PHASE TO GROUND AND PHASE TO PHASE CLEARANCES.

13'-0 HEIGHT
HEAVY DUTY

DESIGN CRITERIA 138KV STANDARD INSTRUMENT TRANSFORMER STAND CENTERPOINT ENERGY, INC. HOUSTON, TEXAS

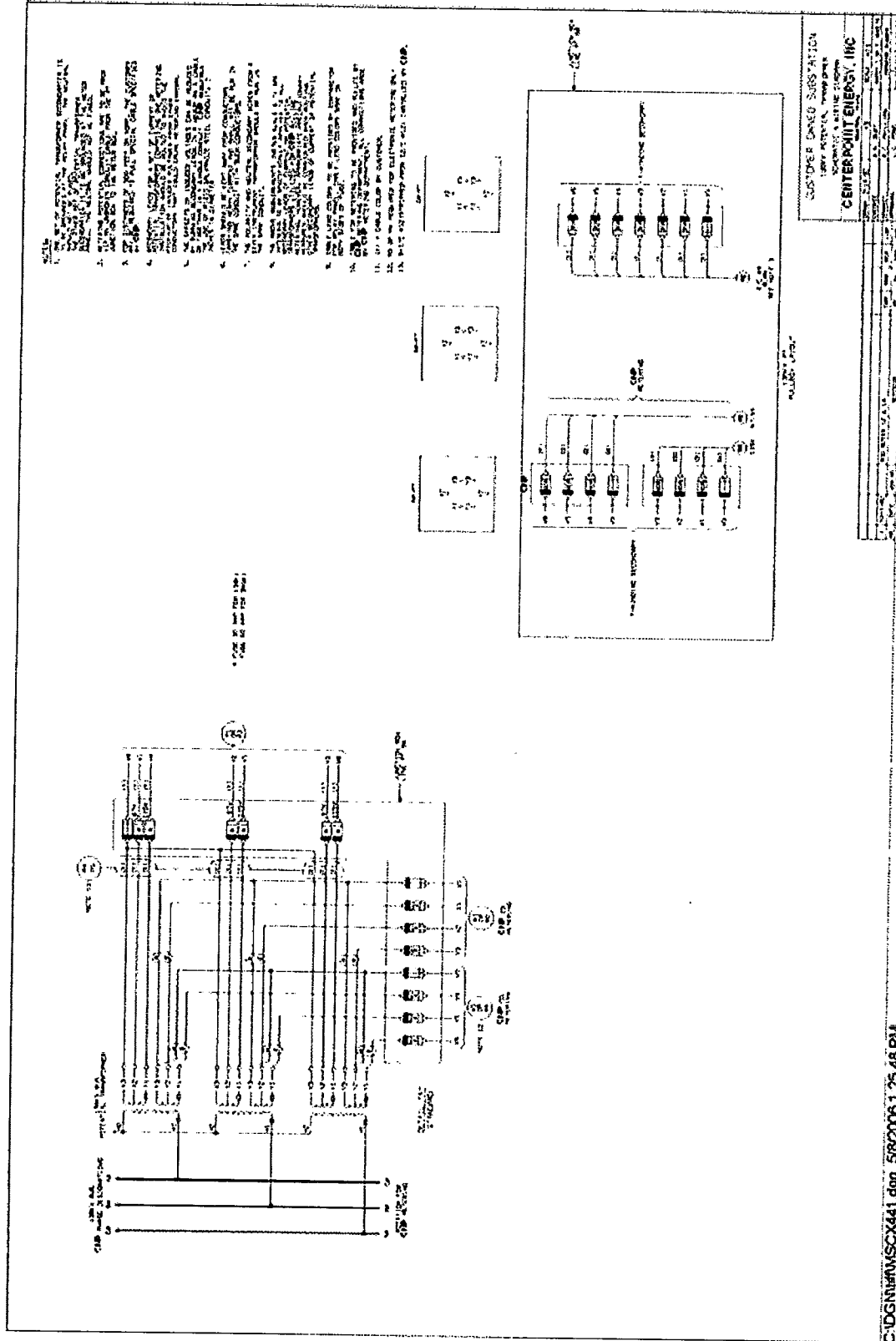
CDRWA 1-24-94	REK	DATE NTS
REVISED 24-94	REK	DATE 4 of 4
COMMENTS		
APPROVED		171190 06

Rev 14 Date 7-22-2005 Items Revised 4000A and other updates

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