



Eric M. Dessen Associate Counsel

February 6, 2006

<u>Via DHL Express</u> Honorable William Bouteiller Administrative Law Judge New York State Department of Public Service Three Empire State Plaza Albany, New York 12223-1350

Honorable Elizabeth Liebschutz Administrative Law Judge New York State Department of Public Service Three Empire State Plaza Albany, New York 12223-1350

> Re: Case 05-T-1369 – In the Matter of the Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need under Article VII of the New York State Public Service Law for the Cedar Street Project

Dear Judges Bouteiller and Liebschutz:

On November 1, 2005 Con Edison filed an application (the "Application") with the New York State Public Service Commission (the "Commission") seeking a certificate of environmental compatibility and public need pursuant to Article VII of the Public Service Law ("PSL") for the construction and operation of up to two underground 138 kilovolt ("kV") electric transmission feeders along a single transmission line route, approximately three miles long, in southeastern Westchester County, New York ("Westchester County" or the "County"). The Application proposed that the feeders and associated equipment (including two 138 - 13.8 kV transformers at the Cedar Street Substation) would connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with Con Edison's existing Cedar Street Substation located in the City of New Rochelle.

Con Edison has reevaluated its long-term forecast in light of new developments for anticipated area load growth projects and determined that the construction of a second transmission feeder was no longer justified. Based on this determination, Con Edison is now seeking a certificate of environmental compatibility and public need pursuant to Article VII of the Public Service Law ("PSL") for the construction and operation of a single underground 138 kilovolt ("kV") electric transmission feeder along the transmission line route previously proposed. The feeder and associated equipment February 6, 2006 Page 2

(including one 138 – 13.8 kV transformer at the Cedar Street Substation) will connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with Con Edison's existing Cedar Street Substation located in the City of New Rochelle (the "Project").

Since the change in the Project alters slightly the information set forth in the Application, Con Edison submits the following revised information:

- 1. <u>Revised Figure 5-3</u> A revised design drawing indicating one feeder instead of two feeders (Attachment A);
- 2. <u>Revised Figure E-3-1</u> A revised drawing of the new typical duct bank cross section (Attachment B);
- 3. <u>Revised Figure E-3-2</u> A revised drawing of the cross section of the new typical duct bank cross section (Attachment C);
- 4. <u>Revised Cost Estimate</u> The cost estimate for the project has been reduced from \$56,672,056 to \$44,166,137;
- <u>Revised Table 4.10 -1</u> A revised EMF analysis indicating that EMF levels will remain substantially within the Commission's 1990 Interim Policy. (Attachment D).

If you have any questions, please do not hesitate to contact me.

Respectfully submitted,

Eric Dessen

Enclosures

C: Attached Service List Steven Blow, Esq. (NYSDPS) Norman Morrison (NYSDPS) Craig Wolfgang Kevin Maher Attachment A Revised Figure 5-3 Attachment B Revised Figure E-3-1





Typical Duct Bank Cross Section

and a second second

Attachment C Revised Figure E-3-2





Cross Section of Typical Manhole Installation

# Attachment D

Revised Table 4-10-1 EMF Analysis

Table 4.10-1 of the Application presented the results of its EMF analysis for the proposed feeder from the Washington Street Substation to the Cedar Street Substation. As indicated in §4.10.3 of the Application, the analysis was based on the maximum capacity of the transformer of 80 MVA and 425 amperes of current in the circuits. The projected loading of the transformer has been reduced and, correspondingly, the amperes on the circuits have been reduced to 395 amperes. This represents the winter maximum normal feeder rating.

Part A of this analysis presents the EMF calculations and input data with these assumptions. We are presenting results for a 3-foot cover, as assumed in the filing, as well as a 2-foot cover.

Part B of this analysis presents the EMF calculations and input data for a second EMF analysis for the feeder. This is similar to the analysis presented in Part A, except that it assumes that the circuits operate at a winter normal conductor rating of 835 amperes.

Part C of this analysis sets forth the maximum magnetic field levels at the boundary of the Cedar Street Substation, with one new transformer.

<u>**Part A**</u>: EMF Calculations based on the maximum capacity of the transformer of 80 MVA and 425 amperes of current in the circuits

The following assumptions were made when performing the EMF calculations:

- 1500 kcmil cable
- 2 X2 configuration
- 8.25-inch vertical phase spacing, 13.5-inch horizontal phase spacing
- 1.3-inch conductor diameter & 3.8-inch shield diameter

Winter normal feeder current of 395 Amps (see response to DPS-2) 2 or 3 ft. of cover

calculations made at a height of 3.28 feet (1 meter) above ground level

	Number of 3		Circuit	MAGNETI	ETIC FIELD (mG)			
Case	Phase Circuits (3 Cables/CKT)	Number of Cables	Load per Phase (A)	Maximum50 ft. from(2 or 3Center Linefoot(2 or 3 footcover)cover)		Shield Ground		
138 k	V supply to the Cedar	Street Subs	tation			•		
1-a	1	3	395	77.2/57.5	1.2/1.2	SPB <sup>1</sup>		
1-b	1	3	395	1.5/1.1	0.02/0.02	MPB <sup>2</sup>		

Notes: 'SPB – Single Point Sheath Bond

<sup>2</sup>MPB – Multi-Point Sheath Bond

<u>**Part B**</u>: EMF Calculations assuming the circuits operate at a winter normal conductor rating of 835 amperes

The following assumptions were made when performing the EMF calculations:

1500 kcmil cable

2 X 2 configuration

8.25-inch vertical phase spacing, 13.5-inch horizontal phase spacing.

1.3-inch conductor diameter & 3.8-inch shield diameter

Winter normal conductor rating of 835 Amps.

2 or 3 ft. of cover

calculations made at a height of 3.28 feet (1 meter) above ground level

				MAGNETIC	GNETIC FIELD (mG)			
Case	Number of 3 Phase Circuits (3 Cables/CKT)	Number of Cables	Circuit Load per Phase (A)	Maximum (2 or 3 foot cover)	50 ft. from Center Line (2 or 3 foot cover)	Shield Ground		
138 k	V supply to the Ceda	r Street Sub	station		·	<u>.                                    </u>		
1-a	1	3	835	163.1/121.6	2.6/2.6	SPB <sup>1</sup>		
1-b	1	3	835	3.1/2.3	0.04/0.04	MPB <sup>2</sup>		

Notes: <sup>1</sup>SPB – Single Point Sheath Bond <sup>2</sup>MPB – Multi-Point Sheath Bond

<u>**Part C**</u>: EMF Calculations within the Cedar Street Substation with 1 additional transformer (total of 3 transformers in service) and the circuits operating at the winter normal conductor rating.

There are currently 2 transformers in service at the Cedar Street Substation. The magnetic field levels at the boundary of the Cedar Street Substation, with one additional transformer, will not exceed 120 mG.

# CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. CEDAR STREET PROJECT PUBLIC SERVICE LAW ARTICLE VII APPLICATION SERVICE LIST

#### **State Agencies and Officials**

The Honorable Jaclyn A. Brilling Secretary to the Commission NYS Public Service Commission Three Empire State Plaza, 14<sup>th</sup> Floor Albany, NY 12223-1350

The Honorable Denise M. Sheehan, Acting Commissioner NYS Department of Environmental Conservation 625 Broadway Albany, NY 12233-1011

The Honorable Thomas J. Madison, Jr. Acting Commissioner New York State Department of Transportation 50 Wolf Road Albany, NY 12232

The Honorable Randy A. Daniels Secretary of State New York State Department of State 41 State Street Albany, NY 12231-0001

NYS Assemblywoman Amy Paulin 88<sup>th</sup> Assembly District 700 White Plains Rd. Suite 252 Scarsdale, NY 10583

NYS Senator Jeff Klein, District 34 3713 East Tremont Avenue, Lower Level Bronx, New York 10465 The Honorable Nathan L. Rudgers Commissioner NYS Department of Agriculture and Markets 10B Airline Drive Albany, NY 12235

Mrs. Margaret Duke, Environmental Permits NYS Department of Environmental Conservation Region 3 Office 21 South Putt Corners New Paltz, NY 12561

The Honorable Bernadette Castro Commissioner New York State Office of Parks, Recreation and Historic Preservation Empire State Plaza Agency Building 1 20<sup>th</sup> Floor Empire State Plaza Albany, NY 12238

The Honorable Charles A. Gargano Commissioner Empire State Development Corporation 633 Third Avenue, 33<sup>rd</sup> Floor New York, NY 10017-6706

NYS Senator Suzi Oppenheimer, District 37 222 Grace Church Street, 3rd Floor Port Chester, NY 10573

NYS Senator Ruth Hassell-Thompson, District 36 767 East Gunhill Road Bronx, New York 10467

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NYS Assemblyman George S. Latimer 91<sup>th</sup> Assembly District 933 Mamaroneck Avenue Suite 102 Mamaroneck, NY 10543 NYS Assemblyman J. Gary Pretlow 87<sup>th</sup> Assembly District 6 Gramatan Ave. Mt. Vernon, NY 10550

#### Westchester County Representatives

The Honorable James Maisano Westchester County Legislator - District 11 800 Michaelian Office Building 148 Martine Avenue White Plains, NY 10601

The Honorable Vito Pinto Westchester County Legislator – District 10 800 Michaelian Office Building 148 Martine Avenue White Plains, NY 10601

The Honorable Clinton I. Young, Jr Westchester County Legislator – District 13 800 Michaelian Office Building 148 Martine Avenue White Plains, NY 10601 Mr. Salvatore J. Carrera, Director Westchester County Office of Economic Development Michaelian Office Building 148 Martine Avenue, Room 901 White Plains, NY 10601-2963

The Honorable Andrew J. Spano Westchester County Executive 800 Michaelian Office Building 148 Martine Avenue White Plains, NY 10601

#### **Municipal Officials**

Mr. Ernest D. Davis Mayor 1 Roosevelt Sq, Room 107 Mount Vernon, NY 10550

Mr. Timothy C. Idoni Mayor City Hall, 515 North Avenue New Rochelle, NY 10801 Mr. Michael Clain Mayor Pelham Village Hall 195 Sparks Avenue Pelham NY 10803

Mr. Richard Slingerland Village of Pelham Administrator Pelham Village Hall 195 Sparks Avenue Pelham, NY 10803

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### Libraries

Mount Vernon Central library 28 South First Ave Mount Vernon, NY 10550

New Rochelle Public Library 1 Library Plaza New Rochelle, NY 10801 Pelham Public Library 530 Colonial Avenue Pelham, NY 10803

## **Other Interested Parties**

New York State Thruway Authority Administrative Headquarters 200 Southern Blvd., P.O. Box 189 Albany, NY 12201-0189

Donna K. Hintz, Senior Attorney NYS Department of Transportation 50 Wolf Road Albany, NY 12232 Tel: 518-457-2411 Fax: 518-457-4021 E-mail: dhintz@dot.state.ny.us Metro North Railroad James J. Gillies, Director, Power Systems Power Department 420 Lexington Avenue New York, New York 10017





Eric M. Dessen Associate Counsel

February 6, 2006

<u>Via DHL Express</u> Steven Blow, Esq. Assistant Counsel Public Service Commission Department of Public Service Three Empire State Plaza Albany, New York 12223

# Re: Case 05-T-1369 – In the Matter of the Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need under Article VII of the New York State Public Service Law for the Cedar Street Project

Dear Mr. Blow:

On November 1, 2005 Con Edison filed an application (the "Application") with the New York State Public Service Commission (the "Commission") seeking a certificate of environmental compatibility and public need pursuant to Article VII of the Public Service Law ("PSL") for the construction and operation of up to two underground 138 kilovolt ("kV") electric transmission feeders along a single transmission line route, approximately three miles long, in southeastern Westchester County, New York ("Westchester County" or the "County"). The Application proposed that the feeders and associated equipment (including two 138 - 13.8 kV transformers at the Cedar Street Substation) would connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with Con Edison's existing Cedar Street Substation located in the City of New Rochelle.

Con Edison has reevaluated its long-term forecast in light of new developments for anticipated area load growth projects and determined that the construction of a second transmission feeder was no longer justified. Based on this determination, Con Edison is now seeking a certificate of environmental compatibility and public need pursuant to Article VII of the Public Service Law ("PSL") for the construction and operation of a single underground 138 kilovolt ("kV") electric transmission feeder along the transmission line route previously proposed. The feeder and associated equipment (including one 138 – 13.8 kV transformer at the Cedar Street Substation) will connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with Con Edison's existing Cedar Street Substation located in the City of New Rochelle (the "Project"). Steven Blow, Esq February 6, 2006 Page 2

In compliance with 16 NYCRR §5.7, Con Edison hereby submits the following revised responses to the Staff Of the Department of Public Service's first set of discovery requests in the above-referenced proceeding:

- 1. Revised response to DPS-7;
- 2. Revised response to DPS-12; and
- 3. Revised response to DPS-14.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Eric Dessen

Enclosures

C: ALJ Elizabeth Liebschutz

Bc: Jeffrey Riback, Esq. Joseph Liberatori Craig Wolfgang (TRC) Kevin Maher (TRC)

#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request	
No.:	DPS-7
Requested	Hebert Joseph, (518) 486-2460
By:	December 12, 2005
Date of Request:	
Reply Date:	
Witness:	EMF
Subject:	

Provide the EMF calculations and input data used in computing the results. Include a description of all assumptions used in making the calculations.

# Response to DPS-7:

Table 4.10-1 of the Cedar Street Project Article VII application presented the results of its EMF analysis for the proposed feeder from the Washington Street Substation to the Cedar Street Substation. As indicated in §4.10.3 of the application, the analysis was based on the maximum capacity of the transformer of 80 MVA and 425 amperes of current in the circuits. The projected loading of the transformer has been reduced and, correspondingly, the amperes on the circuits have been reduced to 395 amperes. This represents the winter maximum normal feeder rating.

Part A of this response presents the EMF calculations and input data with these assumptions. We are presenting results for a 3-foot cover, as assumed in the filing, as well as a 2-foot cover.

Part B of this response presents the EMF calculations and input data for a second EMF analysis for the feeder. This is similar to the analysis presented in Part A, except that it assumes that the circuits operate at a winter normal conductor rating of 835 amperes.

Part C of this response presents the results of the Company's EMF analysis within the Cedar Street Substation. There are currently 2 transformers in service at the Cedar Street Substation. The analysis shows the impacts with 1 additional transformer (total of 3 transformers in service).

**Part A**: EMF Calculations based on the maximum capacity of the transformer of 80 MVA and 425 amperes of current in the circuits

The following assumptions were made when performing the EMF calculations:

- 1500 kcmil cable
- 2 X2 configuration
- 8.25-inch vertical phase spacing, 13.5-inch horizontal phase spacing
- 1.3-inch conductor diameter & 3.8-inch shield diameter
- Winter normal feeder current of 395 Amps (see response to DPS-2)
- 2 or 3 ft. of cover
- calculations made at a height of 3.28 feet (1 meter) above ground level

			0	MAGNETIC FIELD (mG)			
Case	Number of 3 Phase Circuits (3 Cables/CKT)	Number of CablesCircuit Load per Phase (A3 kV supply to the Cedar3 kV supply to the Cedar		Maximum (2 or 3 foot cover)	50 ft. from Center Line (2 or 3 foot cover)	Shield Ground	
-	138 k	V supply to I	he Cedar Sti	reet Substat	ion		
1-a	1	3	395	77.2/57.5	1.2/1.2	SPB <sup>1</sup>	
1-b	1	3	395	1.5/1.1	0.02/0.02	MPB <sup>2</sup>	

Notes: <sup>1</sup>SPB – Single Point Sheath Bond <sup>2</sup>MPB – Multi-Point Sheath Bond

The detailed results for each of the Cedar Street EMF calculation cases in Part A are provided in the following attachments:

- Attachment DPS-7 Cedar Street EMF Calculations Part A Case 1a;
- Attachment DPS-7 Cedar Street EMF Calculations Part A Case 1b;

**Part B**: EMF Calculations assuming the circuits operate at a winter normal conductor rating of 835 amperes

The following assumptions were made when performing the EMF calculations:

- 1500 kcmil cable
- 2 X 2 configuration
- 8.25-inch vertical phase spacing, 13.5-inch horizontal phase spacing.
- 1.3-inch conductor diameter & 3.8-inch shield diameter
- Winter normal conductor rating of 835 Amps.
- 2 or 3 ft. of cover
- calculations made at a height of 3.28 feet (1 meter) above ground level

				MAGNETIC FIELD (mG)			
Case	Number of 3 Phase Circuits (3 Cables/CKT)	Number of Cables	Circuit Load per Phase (A) (2 or 3 foot cover)		50 ft. from Center Line (2 or 3 foot cover)	Shield Ground	
	138	kV supply to	the Cedar	Street Substation	n		
1-a	1	3	835	163.1/121.6	2.6/2.6	SPB <sup>1</sup>	
1-b	1	3	835	3.1/2.3	0.04/0.04	MPB <sup>2</sup>	
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Notes: <sup>1</sup>SPB – Single Point Sheath Bond <sup>2</sup>MPB – Multi-Point Sheath Bond

The detailed results for each of the Cedar Street EMF calculation cases in Part B are provided in the following attachments:

- Attachment DPS-7 Cedar Street EMF Calculations Part B Case 1a;
- Attachment DPS-7 Cedar Street EMF Calculations Part B Case 1b;

**Part C**: EMF Calculations within the Cedar Street Substation with 1 additional transformer (total of 3 transformers in service) and the circuits operating at the winter normal conductor rating.

The detailed results of these calculations are provided in the following attachment:

• Attachment DPS-7 - Cedar Street EMF Calculations – Part C – 3 Transformers

Attachment DPS-7 - Cedar Street EMF Calculations - - Part A - Case 1a

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DPS-7. Parl A - Case la:

Collar Stored Feeder SPB 2×2 Configuration Current 395A/Phas 2 DFeet Cover



.

CALCULATED MAGNETIC FIELD VALUES

X(ft) -50.0 -49.0 -48.0 -47.0 -45.0 -45.0 -45.0 -42.0 -42.0 -42.0 -42.0 -42.0 -43.0 -43.0 -43.0 -43.0 -43.0 -43.0 -43.0 -33.0 -34.0 -33.0 -34.0	m <sup>Q</sup> 1.22 1.32 1.37 1.49 1.53 1.79 1.98 1.98 1.98 1.98 2.19 1.98 2.19 2.44 2.53 2.73	X(Et) -30.0 -29.0 -28.0 -27.0 -26.0 -25.0 -24.0 -23.0 -21.0 -21.0 -20.0 -19.0 -18.0 -17.0 -15.0 -15.0 -13.0	mG 3.50 3.74 4.30 4.30 5.48 5.48 5.48 5.48 5.48 5.48 5.48 7.68 5.48 10.68 9.46 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 10.00	X(ft) -9.0 -9.0 -7.0 -5.0 -5.0 -4.0 -2.0 -1.0 0.0 12.0 3.0 5.0 7.0	mG 22,00 25,46 29,63 40,60 47,51 55,19 55,19 70,28 75,37 75,20 75,37 75,20 62,94 40,55 40,	X(ft) 10.0 11.0 12.0 13.0 14.0 15.0 15.0 17.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0	86 22,26 19,26 14,12 10,48 11,748 11,448 11,	X(ft) 30.0 31.0 32.0 34.0 35.0 36.0 37.0 38.0 41.0 42.0 42.0 45.0 45.0 47.0	m30914 3.0914 2.599 2.545 2.098 1.880 1.59 1.594 1.594 1.594 1.384 1.384
-33.0 -32.0 -31.0	2.73 2.96 3.08	-13.9 -12.0 -11.9	13.03 14.73 16.73 19.13	7.0 8.0 9.0	34.80 29.80 25.62	26.0 27.0 28.0 29.0	4.33 4.03 3.76 3.52	46.0 47.0 48.0 49.0	$     1.44 \\     1.38 \\     1.32 \\     1.27 $

PC-FIELD INFUT DATA FOR CEDARS . PCF

Title:

Cedar Street 138 kV solid dielectric cable , 1500 kcmil

User: Date: 02/01/2006 Time: 2:36 PM Frequency: 60.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Grounded? N Shield currents known? N

Cnd	X-Coord	Depth	Diame	ters	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)&	hld(in)	Amps	Deg	Amps	Deg
01	-6.750	31.375	1.300	N/A	395.00	0.0	N/A	N/A
02	-6.750	39.620	1.300	N/A	395.00	-120.0	N/A	N/A
03	6.750	39.620	1.300	N/A	395.00	-240.0	N/A	N/A

Cedar Strub 1 Feider SPB 2×2 Configuration Current 39 5 A/Phase 3 Feel Cover.



CALCULATED MAGNETIC FIELD VALUES

X(ft) -50.0 -49.0 -47.0 -46.0 -38.0 -38.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0 -33.0	mG 1.21 1.26 1.31 1.42 1.42 1.55 1.62 1.78 1.95 2.95 2.17 2.41 2.55 2.70 2.86	X(ft) -30.0 -29.0 -28.0 -26.0 -26.0 -26.0 -25.0 -24.0 -21.0 -21.0 -21.0 -19.0 -19.0 -15.0 -15.0 -13.0 -12.0	mG 3.235 3.468 3.468 4.59 3.468 4.59 3.468 4.59 3.468 4.59 3.468 4.59 3.468 4.59 3.66 7.419 9.05 4.199 5.729 3.69 5.62 3.69 5.62 3.69 5.62 3.69 5.62 5.62 5.62 5.62 5.62 5.62 5.62 5.62	X(fr) -10.6 -9.6 -7.6 -7.6 -5.6 -3.6 -1.0 -2.0 -1.0 -1.0 -2.0 -4.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -5.0 -5.0 -5.0 -5.0 -5.0 -5.0 -5.0 -5	mG 20.05 22.89 30.04 39.25 39.32 49.35 56.35 56.46 53.57 49.30 34.30 35.30 34.30 35.	X(ft) 10:0 11:0 12:0 13:0 14:0 15:0 15:0 15:0 15:0 15:0 15:0 15:0 15	mG 20.17 17.78 15.69 13.93 12.42 11.13 10.01 9.05 8.21 7.48 6.27 5.32 4.92 5.32 4.57 4.25 3.96 3.70	X(ft)) 31.0 32.0 334.0 35.0 35.0 39.0 41.0 42.0 42.0 45.0 45.0 45.0 45.0 45.0 45.0 45.0 45	mG5532.0571 3.20572.22.29 2.22.29 2.2970 1.70770 1.6569370 1.4370 1.4370
-33.0	2.70	-13.0	13.83	7.0	30.16	27.0	3.96	47.0	1.37
-32.0	2.86	-12.0	15.58	8.0	26.33	28.0	3.70	48.0	1.31
-31.0	3.04	-11.0	17.64	9.0	23.01	29.0	3.46	49.0	1.26

Title:

Cedar Street 138 kV solid dielectric cable , 1500 kcmil

User: Date: 02/01/2006 Time: 2:25 PM Frequency: 60.0 Hz

Earch resistivity	1000.000 Ohm-m
Multi-Grounded?	N
Shield currents known?	N



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CALCULATED MAGNETIC FIELD VALUES

X(ft)	mG	X(ft)	нG	X(ft)	mG	X(ft)	mG	X(ft)	шĜ
-30.0	U.UZ	-30.0	Q.05	-10.0	0.39	10.0	0.48	30.0	0.10
~49.0	0.02	-29.0	0.06	~9.Q	0.45	11.0	0.43	31.0	0 09
-48.0	0.02	-33.0	0.06	-8.0	0.53	12.0	0.38	32 0	0.00
-47.0	0.02	-27.0	0.07	-7.0	0., 63	13.0	0.34	32.0	0.02
-45.0	0.02	-25.0	0.07	-5.0	0.74	14 0	0 31	34 0	0.00
-45.0	0.03	-25.0	0.08	-5.0	0.88	15 0	0.20	24.0	0,08
-44.0	0.03	-24.0	0.08	-4 0	7 03	15.0	0.20	33.0	0.08
-43.0	0.03	-23.0	0.09	-3 0	1 1 6	17 0	0.20	36.0	0.07
-42.0	0.03	-22 0	0 10	-2.0	1 3 3	10.0	0.23	37.0	0.07
~41 0	8 03	-21 0	1 11	1 0	1 1 2 2	10.0	0.2.	38.0	0.07
	0.03	.20 0	0.11	~1.0	1 4.0	19.0	0.19	39.0	0.05
	0.03	14 0	01±2 (r 30	0.0	1.48	20.0	0.3.8	40.0	0.05
	0.03	-19.0	0.13	1.0	1.45	21.0	0.17	41.0	0.05
~ 30.0	0.03	-10.0	0.14	2.0	1.36	22.0	0.15	42.0	0.06
37.0	0.94	-17.0	0.16	3.0	1.24	23.0	0.14	43.0	0.05
-35.0	0.04	-15.0	0.18	4.0	1.10	24.0	0.13	44.0	0.05
35.0	0.04	-15.0	0.20	5.0	0.96	25.0	0.13	45 0	0.05
34 - 0.	0.04	-14-0	0.23	6.0	0.83	26.0	6.12	45.0	0.05
33-0	0.05	-13.0	0.26	7.0	0.72	27.0	6 11	10 0	0.05
-32.0	0:05	-12.0	0.29	8.0	0.63	28.0	6 5 1	30 D	0.05
-31.0	0.05	-1.1.0	0.34	9.0	0.55	20.0	0.21	40.0	0.05
•						4	n 70	49.0	0.05

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Title: Cedar Street 138 kV solid dielectric cable , 1500 kcmil

> User: Date: 02/01/2006 Time: 2:36 PM Frequency: 60.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Grounded? Y Shield currents known? N Sheath resistance 0.001 Ohms/1000 fr

Cnđ No. 01 02 03	&-Coord (in) -6.750 -6.750 6.750 6.750	Depth (in) 31.375 39.620 39.620	Diame Cnd(in)S 1.300 1.300 1.300	ters hld(in) 3.800 3.800 3.800 3.800	Cond Amps 395.00 395.00 395.00	Angle Deg 0.0 -120.0 -240.0	Shieid Amps ? ? ?	Angle Deg ? ?
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Cedar Street IFeeler SPB 2×2 configuration Count 395A/Ph. 3 Feet Cover



CALCULATED MAGNETIC FIELD VALUES

X(Et) -50.0 -49.0 -48.0 -46.0 -45.0 -45.0 -45.0 -45.0 -42.0 -42.0 -40.0 -38.0 -38.0 -38.0 -35.0 -35.0	mG 0.02 0.02 0.02 0.02 0.02 0.03 0.03 0.03	X(ft) -30.0 -29.0 -28.0 -28.0 -26.0 -25.0 -25.0 -24.0 -22.0 -22.0 -19.0 -19.0 -17.0 -16.0 -15.0	mG 0.05 0.05 0.07 0.07 0.08 0.09 0.10 0.12 0.11 0.12 0.13 0.14 0.15 0.19	X(f:) -10.0 -9.0 -7.0 -6.0 -5.0 -5.0 -3.0 -2.0 1.0 0.0 1.0 2.0 3.0 3.0 3.0 5.0	mG 0.35 0.41 0.67 0.54 0.52 0.72 0.31 0.91 1.00 1.08 1.09 1.08 1.03 0.96 0.88 0.79	X(ft) 10.0 11.0 13.0 14.0 14.0 15.0 15.0 17.0 18.0 19.0 21.0 22.0 22.0 22.0 22.0 22.0 22.0 22	mG 0.44 0.39 0.35 0.29 0.22 0.22 0.22 0.22 0.19 0.15 0.15 0.14 0.12	X(ft) 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 40.0 41.0 43.0 43.0 43.0	mG 0.09 0.09 0.08 0.08 0.08 0.08 0.07 0.07 0.07 0.07
-37.0 -36.0 -35.0 -34.0 -32.0 -31.0	0.04 0.04 0.04 0.04 0.05 0.05 0.05	-17.0 -16.0 -15.0 -14.0 -13.0 -12.0 -11.0	$\begin{array}{c} 0.15 \\ 0.17 \\ 0.19 \\ 0.21 \\ 0.24 \\ 0.27 \\ 0.31 \end{array}$	3.0 4:0 5.0 6.0 7.0 8.0 9.0	0.96 0.88 0.79 0.70 0.63 0.55 0.49	23.0 24.0 25.0 26.0 27.0 28.0 29.0	0.14 0.13 0.12 0.12 0.11 0.11 0.10	43.0 44.0 45.0 45.0 45.0 47.0 48.0 49.0	0.00 0.05 0.05 0.05 0.05 0.05 0.05 0.05

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Tiele:

Cedar Street 138 kV solid dielectric cable , 1500 komil

User: Date: 02/01/2006 Time: 2:25 PM Frequency: 60.0 Hz

Earth resistivity 1000.000 Chm-m Multi-Grounded? Y Shield currents known? N Sheath resistance 0.001 Chms/1000 ft

Crid No. 01 02 03	X-Coord (in) -6.750 -6.750 6.750	Depth (in) 43.370 51.620 51.620	Diame Cnd(in)S 1.300 1.300 1.300	ters hld(in) 3.800 3.800 3.800	Cond Amps 395,00 395,00 395,00	Angle Deg 0.0 -120.0 -240.0	Shield Amps ? ? ?	Angle Deg ? ?
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DPS-7 Part B-Casela: Ceolar Street 1 Feeder SPB ZX2 Configuration Current 835A/Phas 2 Feet Cover



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CALCULATED MAGNETIC FIELD VALUES

X(ft) -50.0 -49.0 -48.0 -47.0 -45.0 -45.0 -43.0 -43.0 -43.0 -43.0 -43.0 -43.0 -43.0 -43.0 -40.0	mG 2.57 2.67 2.90 3.03 3.16 3.30 3.46 3.62 3.98	X(ft) -30.0 -29.0 -28.0 -27.0 -26.0 -25.0 -24.0 -23.0 -22.0 -21.0 -2010	mG 8.93 7.40 7.91 8.47 9.10 9.80 10.88 11.45 12.43 13.54 13.54	X(ft) -10.0 -9.0 -7.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0	mG 46.50 53.82 62.64 73.24 85.83 100.44 116.68 133.42 148.57 159.32 163.10	X(ft) 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0	mC 46.82 40.72 35.63 31.37 27.78 24.74 22.15 19.93 18.01 18.35 14.90	X(Et) 30.0 31.0 32.0 33.0 34.0 35.0 35.0 37.0 37.0 39.0 40.0	mG74550 6.55507 5.48055195 4.65195 4.449 4.449
-39.0 -38.0 -37.0 -35.0 -34.0 -34.0 -33.0 -32.0 -31.0	4.18 4.39 4.53 4.88 5.15 5.45 5.77 6.13 6.51	-19.0 -18.0 -17.0 -16.0 -15.0 -14.0 -13.0 -12.0 -11.0	16.24 17.89 19.79 21.99 24.56 27.58 31.14 35.37 40.43	1,0 2,0 3,0 5,0 5,0 7,0 8,0 8,0 9,0	$\begin{array}{c} 158.97\\ 148.10\\ 133.06\\ 116.55\\ 100.53\\ 86.07\\ 72.56\\ 62.99\\ 54.16\end{array}$	21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0	13.63 12.51 11.52 10.64 9.85 9.15 8.52 7.95 7.43	41.0 42.0 43.0 45.0 45.0 45.0 45.0 45.0 45.0 45.0 45	3.80 3.63 3.46 3.31 3.17 3.04 2.91 2.79 2.68

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Title:

Cedar Street 138 kV solid dielectric cable , 1590 kcmil

User: . Date: 02/01/2006 Time: 2:25 PM Frequency: 50.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Grounded? N Shield currents known? N

Chđ	X-Coord	Depth	Diame	ters	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)S	hld(in)	Amps	Deg	Amps	Deg
01	-6.750	31.375	1.300	N/A	835.00	0.0	N/A	N/A
02	-6.750	39.620	1.300	N/A	835.00	-120.0	N/A	N/A
03	6,750	39.620	1.300	N/A	835.00	-240.0	N/A	N/A





CALCULATED MAGNETIC FIELD VALUES

	X(ft)	mG	X(ft)	mG	X(ft)	mij	X(ft)	mG	X(ft)	caG.
	-50.0	2.55	-30.0	6.84	-10.0	42.39	10.0	42.66	30.0	5.87
	-49.0	2.66	-39.0	7.29	-9.0	48.38	11.0	37.52	31.0	6.45
	-48.0	2.77	-28.0	7_78	8.0	55.39	12.0	33.16	32.0	5.08
	-47.0	2.88	-27.0	8.33	-7.0	63.51	13.0	29.44	33.0	5.73
-	-46.0	3.03	-26.0	8.93	-6.0	72.76	14.0	26.26	34.0	5.41
	-45.0	3.14	-25.0	9.60	-5.0	82.98	15.0	23.52	35.0	5.12
	-44.0	3.28	-24.0	10.35	-1.0	93.75	16.0	21.17	36.0	4.85
_	-43.0	3.43	-23.0	11.18	-3.0	104.26	17.0	19.13	37.0	4.60
	-42.0	3.59	-22.0	12.12	~2.0	113.29	18.0	17.36	38.0	4.37
	-41.0	3.76	-21.0	13.17	-1.0	119.47	19.0	15.81	39.0	4.16
	-40.0	3.94	-20.0	14.36	0.0	121.63	20.0	14.45	4.0.0	3.96
	-39.0	4.14	-19.0	15.71	1.Ü	119.35	21.0	13.25	41.0	3.77
	-38.0	4.35	-18.0	17.25	2.0	113.13	22.0	12.19	42.0	3.60
	-37.0	4.58	-17.0	19.61	3.0	104.14	23.0	11.25	43.0	3.44
	-36.0	4.83	-16.0	21.03	4 Ū	93.74	24.0	10.41	44.0	3.29
	-35.0	5.10	15.0	23.37	5.Ű	83.08	25.0	9.65	45.0	3.15
	-34.0	5.39	-14.0	25.08	6.0	72.94	26.0	8.98	46.0	3.62
	-33.0	S.71	m13.0	23.24	7.0	63.75	27.0	8.37	47.0	2.89
	-32.0	6.05	-12.0	32.94	8.0	55.65	28.0	7.82	48.0	2.78
	-31.0	6,42	-11.0	37.29	9.0	48.65	29.0	7.32	49.0	2.67

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Titlet Cedar Street 138 kV solid dielectric cable , 1500 kcmil

> User: Date: 12/21/2005 Time: 1:31 PM Frequency: 60.0 Hz

Earth resistivity 1000.000 Ohmem Multi-Grounded? Mulci-Grounded? N N Shield currents known?

Cnd No. 01 02 03	X-Coord (in) -6.750 -6.750 6.750	Depth (in) 43.370 51.620 51.620	Diame Cnd(in)S 1.300 1.300	ters ald(in) N/A N/A	Cond Amps 835.00 835.00	Angle Deg 0.0 -120.0	Shield Amps N/A N/A	Angle Deg N/A N/A
03	6.750	51.620	1.300	NZA	835.00	-240.0	N/3	N/A

Attachment DPS-7 - Cedar Street EMF Calculations - Part B - Case 1b

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Cedar Struk DPS-7 1 Feeds MPRS Part B-Case 1 b: 2×2 Contigencelia Curred 835 Mms/Ph 394 Cover



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CALCULATED MAGNETIC FLELD VALUES

	X(ft)	mG	X(ft)	шG	$X(\mathfrak{L}\mathfrak{t})$	тG	X(ft)	mG	X18:5	m1/**
	~50.0	0.04	~30.0	0.11	-10.0	0.75	10.0	0.93	30.5	0.20
	-49.0	0.04	~29.0	0.12	-9.0	0.85	11.0	ก่อง	22.5	0.20
	-48.0	0.05	-28.0	0.13	-8.0	0.99	12.6	0.72	20.0	0.19
	-47.0	0.05	-27.0	0.14	-7.6	1.14	13 0	0 67	33.4	0.13
	-46.0	0.05	-26.0	0.15	-6.0	1 32	14 0	0.01	33.0	0.1.1
	-45.0	0.05	-25.0	0.16	-5.0	1 51	16 0	0.01	39.0 36.0	0.16
,	-44.0	0.06	-24.0	0.17	~4 0	1 77	16 0	0.55	33.6	9.10
	-43.0	0.06	-23.0	0 19	-2.0	1 03	17 0	0.51	36.0	0.15
	-42.0	0.06	-22.0	0 20	-2 0	2 1 1	10 0	0.40	37.0	0.14
	-41.0	0.06	-21 0	0.20	-1 0	2	10.0	0.43	38.0	().14
	-40.0	0.07	-20.0	0.22	0.0	2.24	12,0	0.39	39.0	0.13
	-39.0	0 07	-19 0	0.24	10.0	2.39	20.0	9.37	40.0	0.13
	-38.0	0 07	-12.0	0.20	2.0	2.20	21.0	0.34	41.0	0.12
		0 08	-17 0	0.2.5	2.0	2.29	22.0	0.32	42.0	0.12
		0.00	-17.0	0.26		2.04	23.0	0.30	43.0	0.12
	-25 0	0.00		0.30	4.0	1.86	24.0	0.28	44.0	0.11
	-35.0	0.09	12.0	0.4U	.5.0	1.67	25.0	0.26	45.0	0.11
	-39.10 70 A	0.09	14.U	0.45	ь.0	1.49	25.0	0.25	46.0	0.10
	~33.0	0.10	-13.0	0.51	7.0	1.32	27.0	0.23	47.0	0.10
	- 22.0	0.10	~12.0	0.57	8-0	1.17	28.0	0.22	68.0	0.10
	-a.t. 0	0.11	-11.Q	9.65	9.0	1.04	29.0	0.21	49.0	0.10

Cedar Street 136 kV solid dielectric cable , 1500 kcmil

User: Date: 01/31/2005 Time: 4:06 PM Frequency: 50.0 H2

Title:

Earth resistivity 1000.000 Ohm-m Multi-Grounded? Y Shield currents known? N Sheath résistance 0.001 Ohme/1000 ft

Crid X No. 01	-Coord (in) 5.750 4 5.759 5 5.759 5	Depth (in) (3.370 (1.620 (1.620	Diamet Ind (in) Sl 1,300 1.300 1.300	ters	Cond Amps 935.00 935.00 835.00	Angle Deg 0.0 -120.0 -240.0	Shield Amps ? ?	Àngle Deg ? ?
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Cedar Street I Feeder MPB 2×2 Configuration Cworent 835 Amps/Phase 2 Feet Cover



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CALCULATED MAGNETIC FIELD VALUES

X(ft)	mG	X(fin)	mG	X(fc)	mG	X(ft)	mG	X(ft)	mG
-50.0	0.04	-30.0	0.12	-10.0	0.82	10.0	1.02	30.0	0.20
-4.9 , $0$	0.04	-29.0	0.12	-5.0	0.96	11.0	0.90	31.0	0.19
-48.0	0:05	-28.0	0.13	-3.0	1.13	12.0	0.80	32.0	0.18
-47.0	0.05	-27.0	0.14	7.0	2.33	13.0	0.72	33.0	ü 17
-46.0	0.05	-26.0	0.15	-5.0	1.57	14.0	0.64	34.0	0.17
-45.0	0.05	-25.0	0.16	-5.0	1.85	15.0	0.58	35.0	0 15
-44.0	0.06	-24.0	0.1.8	-4.0	2.17	15.0	0.53	36.0	0.15
-43.0	0.06	-23.0	0.19	-3.0	2.50	17.0	0.48	37.0	ñ 18
-42.0	0.06	-22.0	0.21	-2.0	2.81	18.0	0.44	38.0	0 14
-41.0	0.06	-21.0	0.23	-1.0	3.03	19.0	0.41	39.0	0.13
-40.0	0.07	-20.0	0.25	0.0	3.12	20.0	0.38	40.0	0 13
-39.0	0.07	-19.0	0.28	3.0	3.06	21.0	Ũ.35	41.0	0.12
+36.0	0.07	-13.0	0.31	2.0	2.88	22.0	-0.33	42 0	0 12
-37.0	0.08	-17.0	0.34	3.0	2.52	23.0	0,30	43 0	0 12
-36.0	0.08	-15.0	0.38	4.0	2.32	24.0	0.23	44 0	i) 13
-35.0	0.09	-15.0	0.42	5.0	2.03	25.0	0.27	45 0	3 13
-34.0	0.09	-14.0	0.48	6.0	1.75	25.0	0.25	46 0	0 10
-33.0	0.10	-13.0	0.54	7.0	1.53	27.0	0.24	47 0	0 10
-32.0	0.10	-12.0	0.62	8.0	1.33	28.0	0.22	48 0	0 10
-31.0	0.11	-11.0	0.71	9.0	1.16	29.0	0.21	49.0	0.10

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Cedar Street 138 kV solid dielectric cable , 1500 kcmil

User:	
Date:	02/01/2006
Time:	2:25 PM
Frequency:	60.0 Hz

Title:

Earth resistivity	1000.000	Ohm-m	
Multi-Grounded?	y		
Shield currents known?	N		
Sheath resistance	0.001	Obms/1000	۴t:

Cnd No. 01 02 03	X-Coord (in) -6,750 -6.750 6.750	Depth (in) 31.375 39.620 39.620	Diame Cnd(in)S 1.300 1.300 1.300	ters hld(in) 3.800 3.800 3.800	Cond Amps 835.00 835.00 835.00	Angle Deg 0.0 -120.0 -240.0	Shield Amps ? ? ?	Angle Deg ? ?
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# Case 05-T-1369 Con Ed Cedar Street Project

# STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request	
No.:	DPS-12
Requested	Hebert Joseph, (518) 486-2460
By:	December 12, 2005
Date of Request:	
Reply Date:	
Witness:	Project Costs
Subject:	

Provide a complete breakdown and support information for costs in Table 9.1.1. Include copies of all work papers.

Response:

See Revised Attachment DPS-12.

Name of Respondent <u>Bruce Horowitz</u>

-1 -

Revised Attachment DPS 12

### COST FOR CEDAR STREET PROJECT FOR ARTICLE VII APPLICATION

					SEE SUMMARY
		Chatles Denting	<b>_</b>		SHEETS
litom	Dependentie	Station Portion	Transmission Portion		FOR
nem	Description	(Sheet #1)	(Sheet #2)	Total Estimated Cost	DETAILS
1	Easement and R.O.W Agreements and Surveys	0	0	0	
<u> </u>	Material and Supplies				
2	Materiar and Supplies	\$377,083	\$4,035,366	\$4,412,449	1
3	Con Edison Labor				2
	Lane Survey		\$7,500		
	Chem Lab		\$4,800		
	PST Tostino	\$846,784			
	PM&I	\$422,880			
	TB Group - TB Assembly	\$241,200	\$529,166		
	Transportation	\$109,629			
	SSO Supervision & Testing	\$107,003	\$44,2801		
	ECC	\$130,872			
	EC - A/G Elect & Relay Equip Washington St	\$0,000 \$114.755			
	Station Operator	a114,700	F 40 700		
1	Feeder Work		\$10,720		
	SUBTOTAL	\$2 030 273	\$985,898		
4	Construction Contracts	\$2,030,213	\$1,382,364	\$3,612,637	
	Civil	\$3,171,664			3
	Fire Det Sys / FP	\$1,474,154			
1	B/G Electrical	\$362,912			
1	Trench	11	\$3 073 608		
	Boring		\$2,630,400		
	Conduit & MH'S		\$1 901 320		
	Equip/Matl w/ Con Ed labor group	\$332,557	\$108.644		
	(\$97,875+\$15000+\$167000+\$17600+\$30000+5082)		• 100,044		
L	SUBTOTAL	\$5,341,287	\$7,713.972	\$13.055.259	
.5	Purchase Equipment			÷10,000,203	A
	Transformer	\$1,521,100			•
	13 Kv Phase Seg Bus	\$814,875			
	PH Stands/Swgr/CSW (1,721,238+ 597,575)	\$2,318,813		Ì	
	Fire detection Equip	\$293,355	1		
ľ	CT's Rel Panels and Misc	\$200,000		Í	
	Kelay Equip Wash St	\$33,249		·	
	Other Direct Costs	\$5,181,392		\$5,181,392	
° .		<b></b>	T		5
	Environmental & Mise	\$185,000			i
	Article 7 Consultant	\$65,500	1		
	Simevor/Photo/PE Sve	\$350,000	ł		
ł	Inden Test / Abstement	\$100,000			
	SUBTOTAL	\$0	\$150,000		
7	Contingency	\$700,500	\$150,000	\$850,500	
		#3,743,600	\$3,617,600	\$7,361,200	6
8	Escalation	\$408,700	\$404,300	\$813,000	7
9	Overheads and AFDC				
	ОН	\$3 787 100	\$3.674 600		8
	AFDC	\$891 300	\$3,074,300 \$526 800	1	
L	SUBTOTAL	\$4,678,400	\$4 201 300	CD 070 700	
	TOTAL ESTIMATED COST	\$22,461,235	\$21 704 002	30,679,700	
<b>•</b> • • • • • • • • • • • • • • • • • •			<u>Ψ41,704,902</u>	\$44,166,137]	

Note:

Estimate revised to reflect the removal of the second feeder duct and associated equipment.
Feeder work was re-allocated from Contractor to Company work forces.

		Sheet Z			
PROJECT NO21155-04		CENTRAL ENGINEERING	APPRO	2. START 12/05/2005	COMPL . 01/20/2006
BUDGET NO		CONCEPTUAL ESTIMATE	ENG/D	CS. START 01/10/2005	COMPL . 03/31/2006
ESTIMATE NO05-4147-AB-02	For	Reviewand Comment	() PRODU	A START 02/01/2005	COMPL . 12/04/2006
EST. DATE01/31/2006			CONST	A. START 06/26/2006	COMPL . 05/16/2007
PROJ ENG AMIT MUKHOPADHYAY			PROJE	T IN SERVICE	; 05/16/2007
PROJ EST ANTHONY BOSCO	r		OUTAG	E IS REQUIRED	
LOCATION WASHINGTON STREET TO C	CEDAR STRI	ET			

DESCRIPTION. . 138KV SOLID DIELECTRIC CABLE-ONE FEEDER-ONE DUCT 1500MCM

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		COMPANY			CONTRA	CT	TOTAL	3%	OVERHEADS	20%	
ITEM	MHRS	LABOR\$	EQ/MATS	MHRS	LABOR\$	EQ/MAT\$	DIRECT	ESCAL	& AFDC	CONTING	TOTAL
CONSTRUCTION CONTRACTS								<del>~</del>			
TRENCH BORINGS CONDUITS & MH'S COMPANY LABOR				21812 18554 12285	1848609 1580800 .1054961	1224999 1049600 846359	3073608 2630400 1901320	92200 78900 57000	895600 766400 554000	812300 695100 502500	4873708 4170800 3014820
LANE SURVEY CHEM LAB TRANSPORTATION P.M.6I. STATION OPERATOR FDR WORK MATTRIALS AND SUPPLIES	112 60 540 7898 160 13157	7500 4800 44280 529166 10720 985898	100000 C		· .	•	7500 4800 144280 529166 10720 994542	200 100 4300 15900 300 29800	3400 2100 49700 245500 5000 460000	2200 . 1400 39700 158100 3200 296900	13300 9400 237980 948666 19220 1781242
CABLE & ASSOC EQUIP. OTHER DIRECT COSTS			4035366				4035366	121100	1175800	1066500	6398766
ENV TESTING		•				150000	150000	4500	43800	39700	238000
	21927	1582364	4144010	52651	4484370	3270958	13481702	404300	4201300	3617600	21704902
·							1	Ð	٨		1,704,902

CONCEPTUAL ESTIMATE	\$ 21,704,902						
OVERHEADS 17.32 % CENTRAL ENGI	NE; 3.76 % A & S;	16.28 % P'ROLL TAX & PENS;			· TOTAL	OH'S =	\$3,674,500
REMARKS	, ( , , , , , , , , , , , , , , , , , ,	) ( 3636,900 )			5.00 %	AFDC =	
CENTRAL ENGINEERING	PROJECT MAN	AGER OR USER ORGANIZATION	CONSTRUCTIO	N MANAGER			<u></u>
APPROVED BY	APPROVED BY		APPROVED BY				2499
	Date	· · · · · · · · · · · · · · · · · · ·	Dațe			Date	
			•				
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PROJECT NO 21155-04		CENTRAL ENGINEERING	10000	GM1 DM 10 /05 /0000	
BUDGET NO		CONTROL ANDINEERING	APPROP.	START 12/05/2005	COMPL . 01/20/2006
ESTIMATE NO., 05-4147-AB-02	12	CONCEPTUAL ESTIMATE	ENG/DES.	START 01/10/2005	COMPL . 03/31/2006
EST. DATE01/31/2006	KeV	lewand Comment	O produby	START 02/01/2005	COMPL . 12/04/2006
PROJ ENG AMIT MUKHOPADHYAY			CONSTR.	START 06/26/2006	COMPL . 05/16/2007
PROJ EST ANTHONY BOSCO 120 1			PROJECT	IN SERVICE	: 05/16/2007
AN BIT			OUTAGE	IS REQUIRED	
LOCATION WASHINGTON STREET TO CEDAR STRE	ET				
DRCCRIPTON 120M ON TO DESCRIPTION					

DESCRIPTION. 138KV SOLID DIELECTRIC CABLE-ONE FEEDER-ONE DUCT 1500MCM

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		COMPAN	Y		CONTRA	CT	TOTAL	38	OVERHEADS	201	
	MHRS	LABOR\$	EQ/MAT\$	MHRS	LABOR\$	EQ/MAT\$	DIRECT	ESCAL	& AFDC		TOTAL
CONSTRUCTION CONTRACTS											
TRENCH BORINGS CONDUITS & MH'S COMPANY LABOR				21812 18554 12285	1848609 1580800 1054961	1224999 1049600 846359	3073608 2630400 1901320	92200 78900 57000	895600 766400 554000	812300 695100 502500	4873708 4170800 3014920
LANE SURVEY CHEM LAB TRANSPORTATION P.M.GI. STATION OPERATOR FDR WORK MATERIALS AND SUPPLIES	112 60 540 7898 160 13157	7500 4800 44280 529166 10720 985898	100000 8644				7500 4800 144280 529166 10720 . 994542	200 100 4300 15900 300 29800	3400 2100 49700 245500 5000 460000	2200 1400 39700 158100 3200 296900	13300 8400 237980 948666 19220 1781242
CABLE & ASSOC EQUIP. OTHER DIRECT COSTS			4035366				4035366	121100	1175800	1066500	639876 <b>6</b>
ENV TESTING	····					150000	150000	4500	43800	39700	238000
	21927	1582364	4144010	52651	4484370	3270958	13481702	404300	4201300	3617600	21704902

\$ 21,704,902

CONCEPTUAL	L ESTIMATE \$	21,70	04,902									
OVERHEADS	17.32 % CENTRAL ENGINE;	3,	76 % A & S; 16.2	8 %	P'ROLL TAX & PENS;	;			TO	AL OF	1'S =	\$3,674,500
	( \$2,405,000 )		\$612,600 )	(	\$656,900 )		(	\$0)	3.00	% A5	DC =	\$526,800
CENTRAL ENG	GINEERING		PROJECT MANAGER O	R US	SER ORGANIZATION		CONSTRUCTION	MANAGER				
APPROVED BY	ť		APPROVED BY				APPROVED BY					24
		Date				Date						

#### PRELIMINARY PRINT DATE 01/31/06

# ESTIMATING SECTION REPORT BY GROUP

SPONS.ENGR:

SUPERVISOR:

ESTIMATOR:

SECTION:

#### CEES.R1 PAGE 1 EST. NO.: 05-4147-AB-02

CHECKED/SIGNED:

1.

2.

ESTIMATE NO.: 05-4147-AB-02 PROJECT NO.: 21155-04 BUDGET NO.: LOCATION NO.: WASH ACCOUNT NO.: DISCIPLINE: BLEC.

SUPPORTING: CIVIL

CC #:

DUE	DATE :	01/30/06	LAST	CREATE/UPDATE	PERFORMED
PRO	JECT START:		DATE	01/30/06	
PRO	JECT END:		TIME	08:16	

DESCRIPTION: 138 KV S CEDAR ST

138 KV SOLID DIBLCTRIC CABLE FROM WASHINGTON STREET TO CEDAR STREET TR#3 ONE DUCT/FDR 1500MCM \*\*\*ORDER OF MAGNITUDE\*\*\* \*\*\*REVISED 1/30/06\*\*\*

.

AMIT MUKHOPADHYAY

GEORGE HERSKOWITZ

ANTHONY

BOSCO

384

PRI PRI	BLIMINARY INT DATE 01/31/06			ESTIMAT Repor	TING RT BY	SECTION GROUP		oldest g	CBBS.R1 BST, NO.: ( Roup update 10)	PAGE 2 05-4147-AB-02 /31/05
		****								.,
	GROUP DESCRIPTION	GRP TYPE	MANHOURS	LABOR	B	QUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL
	BASIS OF RETINATE						***************			
XG	UT: FEEDER WORK PH	COMP	13157	985898			5000	2644	2644	
	M&S:138KV CABLE & ASSOC.	COMP						3044	· 3044	994542
va							4035366			4035366
лG	CCETRENCHING	CONT	21812	1848609		146949		1078050	3073608	3073608
	#CC BORINGS	CONT	18554	1580800				1049600	2630400	2630400
XG	CC:CONDUIT/ MH INSTALL	CONT	12285	1054961		384		045000	2000100	2030400
	CL:LANE SURVEY	COMP	110	 BEA0		504		845975	1901320	1901320
	CL CHERT LAD	COMP	112	7500						7500
	CLICHEM LAB	COMP	60	4800						4800
	CL:TRANSPORTATION DEPT.	COMP	540	44280			100000			144290
	CL:P.M. &I	COMP	7898	529166						111200
	CL:STATION OPBRATOR	COMP	160	10720						529166
	ODC. BIEL BEGETING (BEGE STOR		100	10/20						10720
	ODC:ENV TESTING/TEST PITS	CONT						150000	150000	150000
						******				
	COMPANY CONTRAC:		21927 52651	1582364 4484370		147333	4140366	3644 3123625	3644 7755329	5726374 7755329
	** COMPANY TOTAL =	\$	5,726,374	CONTRACT TOTAL		\$7,755,329	BSTIMATE	TOTAL .	\$13,481,702	**
BII	OCHK IF ALL GRPS: COMPANY		21927	1582364				3644		1586008
BII	OCHK IF ALL GRPS: CONTRACT	•	52651	4484370		147333		3123625		7755329

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EQUIPMENT COSTS FOR COMPANY GROUPS ARE NOT SHOWN ON THIS REPORT, AS THEY DO NOT APPLY, ON THE ESTIMATE SCREENS, THESE COSTS SHOULD BE IGNORED AND SUBTRACTED FROM ALL COMPANY GROUPS.

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LEGEND:

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G - THE GROUP HAS BEEN FACTORED X - DETAIL COSTS HAVE EXPIRED # - THE GROUP IS INCOMPLETE

PRELIMINARY				ESTIMA'	TING SECT	ION			CEES	.R1 PAGE	: 3
PRINT DATE 0	1/31/06			REPOI	RT BY GRO	UP		OLDES	EST. ST GROUP UPD	NO.: 05-41 NTE 10/31/0	47 - AB - 02 5
	***************************************										
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
	=======================================			********						*****	
001(01/30/06)	BASIS OF ESTIMATE										
	THE BASIS FOR THIS Estimate is to install a Solid dielectric FDR FROM Washington St to cedar St										
	THIS ESTIMATE IS BEING PREPARED FOR ARTICLE VII SUBMITTAL THIS IS AN ORDER OF MAGNITUDE EST WITH THE APPROPRIATION ESTIMATE TO FOLLOW.										
	SCOPE & DRAWINGS WERE PROVIDED.										
GIREESSEECSER	*******************************					*********	3459655550				
	COMPANY GROUP SUBTOTAL										
040(01/31/06)	UT:FEEDER WORK PH GROUP FACTORS:				1.07						
	POTHEADS			·							
783202430000	RISERS TO POTHEADS										
IB3202010500	POTHEAD SPLICES, 138KV PREPARE FOR PH SPLICING	2	*SET *SET	280 712	19044 47234					19044 47234	
L580770	S&TO, UNDERGR TRANSM (U.T)	200	*HOUR	200	13666					13666	
+H4U//5	BARKSDALE PRESSURE SWITCH	2	BA	80	6420			•		6420	
L580770	INSTALL I.D. TAGS S&TO, UNDERGR TRANSM (U.T)	64	+HOUR	64	4373					4373	
L580770	TAPE COAT JOINTS S&TO, UNDERGR TRANSM (U.T)	64	*HOUR	64	4373					4373	
+Y5000	MISC MAT'LS	1	LS				5000			5000	
		-					. 5000			5000	
IB3202710500 IB3202720500	COMMUNICATION CABLING COMMUNICATION CBL, INSTALL COMMUNICATION CBL, SPLICE	10 10	* SECT * SECT	802 460	54829 31465					54829 31465	

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LEGEND: \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY	1/22/06			ESTIMA	TING SECT	ION			CBE	S.R1 PAG	E 4
PRINI DATE U	1/31/06			REPO	RT BY GRO	UP		OLDES	EST ST GROUP UP	. NO.: 05-4 Date 10/31/	147-AB-02 05
************		*****									
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
		*******	*=====	**********	********	**********		*********			
040(01/31/06)	UT: FEEDER WORK PH (CONT.) GROUP FACTORS:				1.07						
IE3201810500 IE3202220500 IE3201500500	*SPLICE, NORMAL, 138KV *PULL 138KV CABLE, MANHATTN *ID FEEDERS WITH TAGS	11 10 11	*BA *SECT *SECT	4423 4166 53	306467 288503 3608					306467 288503 3608	
UE0311407500 UE0207032500 UE0208021500 UE0301325500 +H24/75	GRD & SURGE ARRESTORS CADWELD,SS,4/0X4/0 CABLE,600V,1C4/0,417J CABLE,600V,1C500,419J CONNECTION,600V,POWER,500 INSTALL SURGE ARRESTORS	36 140 15800 57 11	BA LF LF *BA BA	25 8 1469 85 264	2928 902 170979 9921 21186			303 3342	303 3342	3230 902 170979 13262	
	AND BOXES				11100					21186	
	COMPANY GROUP SUBTOTAL			13157	985898		5000	3644	3644	994542	
060(01/30/06)	M&S:138KV CABLE & ASSOC.										
+Y7500 +Y35 +Y10000 +Y.4 +Y7 +Y4	138KV CABLE JOINTS 138KV SD CABLE 1500 MCM 138KV TERM + ONE SPARE SPACER ASSEMBLY CONDUIT FRE 6" W/FITTINGS 4" HDPE GROUND CONDUIT	33 52272 7 15640 63360 31680	BA LF RA LF LF				247500 1829520 70000 6256 443520 126720			247500 1829520 70000 6256 443520 126720	
+Y2 +Y10000 +Y120 +Y28000 +Y500 +Y6200 +Y8000	3" FRE BARKSDALE PRESSURE SWITCH EMP PLATES PRE-CAST MANHOLES PULL BOX LINK BOXES SURGE ARRESTORS & LINK BOXES INSTALLED IN MH'S	15840 2 3910 11 11 11 11	LF EA PLTS EA EA EA EA				31680 20000 469200 308000 5500 68200 88000			31680 20000 469200 308000 5500 68200 88000	
+Y8.65	 TAX ===================================	37141	LS				321270			321270	
	COMPANY GROUP SUBTOTAL				========	** = = # = = = = = = = =	4035366			4035366	

LEGEND:

\* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY				estimat	ING SECT	ION			CEB	S.R1 PAG	B 5
PRINT DATE 01	/31/06			REPOR	T BY GRO	J.Þ		OLDES	T GROUP UP	. NO.: 05-4 DATE 10/31/	147-AB-02 05
	***************************************										
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
*************		======				********		•••••			
000 /01 /00 /01							*********	2322222222		********	********
072(01/30/06)	CC:TRENCHING GROUP FACTORS:			1.15	1.15	1.15	1.15	1.15			
	WASHINGTON TO CEDAR ST DIRECT 1-TRENCH FOR A TRENCH LENGTH OF 15,840 LF LESS 200LF FOR BORINGS THE TOTAL TRENCH LENGTH IS 15,640LF										
	TOTAL CY OF THE TRENCH INCLUDING KEYWAYS 8689CY										
UT2000045500	TRENCH IS 5'D X 2.5'W SAW CUT PAVEMENT& KEYWAYS 15640'X2 + 2'X1564=34408 CUT PVMT, ASPH, WB, BL, 2/8"A	34408	LF	2176	168949	22701			201522		
IT0701070500 IT0701160500	TRENCH AREA REM AND REPLACED 15,640'X2.5'W/9 PAVEMENT RESTORATION ASPHALT,HOT MIX 003,ASPH HOT MIX,2" 012,ASPH BASE BINDER,4"	4344 4344	* SY * SY	400 500	34380 42975	2347		35310 70621	72037 116529	301573 72037 116529	8.76 16.58 25.83
IT0801040500	022, BASE, CONCRETE, 6"	4344	SY	754	57839	473		86480	144791	144791	33.33
UT2000755500	PLACE CRUSHED STONE BASE PLACE CRUSHED STONE BASE PLACE CRSHD STN, BASE, TO6" 15640'X.5'X2.5' + 1'X5'X 5'X1564 I 2-1043CV	1043	CY	699	59914 55041	7970 8157		62361	130245 63198	130245 63198	29.98 60.59
+125/85	REMOVE EXISTING PAVEMENT TOTAL=15640'X2.5'X 10"TH +2'X5'X10"TH X 1564 /27 =1690CY REMV/DISP PAVING, ASPHALT 15640' X 5'X 2 SIDES + KEY WAYS (353F X 1564)	1690	CY	1715	145763			97175	242938	242938	143.75
	· · ·										

LEGEND: \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY				ESTIMA	TING SECTI	ION		CBES.R1 PAGE 6			
PRINT DATE 01	1/31/06			REPO	RT BY GROU	JP		OLDES	ST GROUP UP	. NO.: 05-4 DATE 10/31/	1147-AB-02 05
~=====================================	***************************************				*==******						
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHR 9	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
***********	=======================================			1010202020	*======================================						
072(01/30/06)	CC:TRENCHING (CONT.) GROUP FACTORE:			1.15	1.15	1.15	1.15	1.15		***********	
IT0501040S00	ASSUME 75% SHEETING 41, PLACE/REMOVE SHEETING	64515	sf	3339	313789	2092		23593	339474	339474	5 26
UC0222211S00	10% BY HAND; 90% BY MACH ASSUME NO ROCK REMOVAL BARTH BAC MACHINE	7820								557171	J.20
UC0222201500 UC0222306500	BARTH EXC, HAND, TO 5'D BARTH FILL, FURN & INSTALL	869 3545	CY CY CY	2302 2199 689	193985 169444 58259	15921		95610	209907 169444	209907 169444	26.84 194.99
	5'-2'-6"-10"=1.7' BACKFIL 1.7'X2.5'X15640' + 1.7'X 1'X5' /27 * 1.2SWELL FACT =3545CY					4701		03012	148027	148652	41.93
UC0222221S00	BARTH DISPOSAL	10427	CY	1679	134501	37268		268480	440249	440249	42.22
	1000' X 100'WIDE STREET IF REQUIRED Allow For Millingerepav'g										
+13/85 +16/85	MILLING REPAVING	12000	SY	1266	107640			71760	179400	179400	14.95
	1.15 TRAFFIC STIPS AND BARRICADES	12000	31	1999	134480			88320	220800	220800	18.40
10000/100	DEATERING, DISPOSAL & PUMPING CREW	1	MON	69	6900			4600	11500	11500	11500.00
15000/85	ALLOW POR INTERPERENCES	1	LS	122	10350			6900	17250	17250	17250.00
5000/85	ALLOW FOR TEMP SUPPORT OF UG UTILIT	1	LS	41	3450			2300	5750	5750	5750 00
15000/85	TRENCH PROTECTION	1	LS	122	10350			6900	17250	17250	17250 00
T0601070500	49, PLATE, PEDESTRIAN, 4MOVE	39100	SF	1529	142602	31305		68716	242622	242622	6.21
		-+====#0:				22222222222					********
	CONTRACT GROUP SUBTOTAL			21812	1848609	146949		1078050	3073608	3073608	

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PRELIMINARY PRINT DATE 01	/31/06			ESTIMA	TING SECT	ION	CEES.R1 PAGE 7 EST. No.: 05-4147-88-02				
	.,			REPO	RT BY GRO	ַ		OLDES	T GROUP UP	DATE 10/31/	05
CODB	GROUP/LINE DBSCRIPTION	QUAN	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
=================						**********					
076(12/15/05)	CC: BORINGS										
+1400/85 +1400/85	BORINGS-1000LF HUTCH RIVER PKWY-BORE HUTCH RIVER PKWY-BORB	1000	lf lf	9882	840000			560000	1400000	1400000	1400.00
+1400/85	BORINGS-160LF NEW YORK THRUWAY-BORE	160	LP	1581	134400			89600	224000		
+L1600/200	AMTRACK BNG, PE SERVICES	4	LF Days	32	6400			83000	224000	224000	1400.00
+250000/85	SITE RESTORATION	4	LOC	7059	600000				. 6400	6400	1600.00
				********				400000	1000000	1000000	250000.00
	CONTRACT GROUP SUBTOTAL	•		18554	1580800			1049600	2630400	2630400	
081(01/30/06)	CC:CONDUIT/ MH INSTALL GROUP FACTORS:			1.20	1.03	1.20	1.20	1,20			
	4-6" PRE, 1-3" PRE & 2-4" HDPE CONDUITS= DIRECT 1-TRENCH FOR A TOTAL LENGTH OF 15840LF										
	ASSEMBLE IN TRENCH										
UT2020561500 UE0110408500 +30/100/70 +20000/120/90 +H.5/100	CONNECT CONDUITS INST PVC CONDUIT 4" CONDUIT,FRE,UNDER GR,3" INSTALL DUCT SYSTEM PC MANHOLES DROP PLATES	31680 15840 15640 11 3910	LF *LF LF EA PLTS	608 1217 3271 1980 2346	40191 113931 280783 203940 201365	384		108726 105837 168912 26400	149301 219767 449695 230340 201365	149301 219767 449695 230340	4.71 13.87 28.75 20940.00
UC0330107500	CONC, COND ENCASEMENT, DC	3431	CY	2277	164909			426789	591699	E01600	172.46
	POTHEAD STANDS AND IN STATION CIVIL WORK W/ STATION FUNDING 2 SETS OF RISER PIPING TO 2 SETS OF PH'S										1/2.40
+28/100/90 +21/100/90	RISER PIPING TO POTHEADS OTHER CONDUIT	1000 1000	lf Lf	302 227	25956 19467			3360 2520	29316 21987	29316 21987	29.32 21.99

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LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY PRINT DATE 01	/31/06			ESTIMA REPO	TING SECT RT BY GRO	ION UP	CEES.R1 PAGE 8 EST. NO.: 05-4147-AB-02 OLDEST GROUP UPDATE 10/31/05				
CODE	GROUP/LINE DESCRIPTION	QUAN	r unit	MANHRS	LABOR	BQUIPMENT	COMPANY	CONTRACT MATERIAL	CONTRACT TOTAL	Total	CONTRACT UNIT PRICE
081(01/30/06)	CC:CONDUIT/ MH INSTALL (CON GROUP FACTORS:	T.)		1.20	1.03	1.20	1.20	1.20	*********		
+650/90	SPLICE/PULL BOXES 1.20 PACTOR 1.10 TRAFFIC STIPS 1.05 CLEANUP/BARRICADES 1.05 TRAFFIC CONGESTION	11	EA	57	4419			3432	7851	7851	713.70
	CONTRACT GROUP SUBTOTAL			12285	1054961	384	**********	845975	1901320	1901320	<b>88282</b> 272
105(12/01/05) +L7500/67	CL:LANE SURVEY Blectric op, Manhattan	1=====	LS	112	7500					7500	
	COMPANY GROUP SUBTOTAL			112	7500		######################################			7500	R4428222
120(12/01/05)	CL: CHEM LAB										
+L80/80	CEN.OPR,LABORATORY DIV.	60 ======	HRS	60	4800					4800	
	COMPANY GROUP SUBTOTAL			60	4800				*********	4800	*******
140(12/01/05)	CL:TRANSPORTATION DEPT.										
+L82/82	TRANS.AND STORES, TRAN. OPR	540	HRS	540	44280					44280	
+¥100000	BQUIPMENT RENTAL	1	LS		******		100000		22.24 (BRAN)	100000	
	COMPANY GROUP SUBTOTAL			540	44280		100000			144280	:5288302

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PRELIMINARY PRINT DATE 01/31/06				ESTIMAT	ING SECT	ION			CBES.R1 P		JE 9
PRINT DATE 01	/31/06			REPOR	T BY GRO	σ₽		OLDES	T GROUP UP	DATE 10/31/	147-AB-02 05
	************************************					**********					
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
			*****	*********				*********			
150(01/31/06)	CL:P.M. &I										
+L67/67	P.M. & I.	7898	HRS	7898	529166		9 mes			529166	
	COMPANY GROUP SUBTOTAL			7898	529166		322223,228	#3##9 <u>,</u> 3#232	473288e32##	529166	<b>33511</b> 2866
160(10/31/05)	CLISTATION OPERATOR			•							
+L67/67	SUBSTATION OPERATOR	160	HRS	160	10720					10720	
					******					*********	
	COMPANY GROUP SUBTOTAL			160	10720					10720	
170(12/01/05)	ODC: ENV TESTING/TEST PITS										
+M150000	CONCRETE & SOIL TESTING	1	LS			_		150000	150000	150000	150000.00
	CONTRACT GROUP SUBTOTAL				9		*********			* = = = = = = = = = = = = = = = = = = =	
								150000	150000	150000	
	•										

\*\* END OF ESTIMATE REPORT \*\*

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PROJECT NO. .. 21155-04

BUDGET NO....

ESTIMATE NO. . 05-4147-A8-03

EST. DATE....01/31/2006

PROJ ENG. .... SHARAD MALLYA

PROJ EST. .... ANTHONY BOSCO

B

LOCATION ..... WASHINGTON STREET TO CEDAR STREET STATION WORK

DESCRIPTION. . 138/13KV TRANSFORMER

		COMPANT	(		CONTRA	Ст	TOTAL	38.	OVERHEAD	S 201	
ITEM	MHRS	LABOR\$	EQ/MAT\$	MHRS	LABOR\$	EQ/MAT\$	DIRECT	ESCAL	& AFDC	CONTIN	NG TOTAL
PURCHASED EQUIPMENT											
TRANSFORMER 138/13 Cedar St			1521100				1521100	45600	482300	409800	2459900
13KV PHASE SEG BUS Cedar St			814875				814875	24400	258400	219500	2430000
FIRE DETECTION EQUIP. Cedar St			293355				293355	8800	230400	219500	131/1/:
CT'S REL. PANELS & MISC. Cedar			200000				200000	6000	63400	53900	979033
RELAY EQUIP WASH ST			33249		-		33249	1000	10500	8900	. 525300
PH STAND & SWGR CEDAR ST			1721238				1721238	51600	545700	463700	270222
CIRCUIT SWITCHERS			597575				597575	17900	189500	161000	2/02230
CONSTRUCTION CONTRACTS							<b>.</b>	11900	109500	101000	903973
CIVIL CEDAR/WASH ST				18913	1953077	1218587	3171664	- 95100	1005400	854400	5176564
FIRE DET SYST/FIRE PROT Cedar				10805	1037845	436309	1474154	344200	467400	397200	2702064
B/G/ELECTRIC CEDAR ST				2973	281654	81258	362912	10900	115000	97800	596617
COMPANY LABOR				•		0,1200	Junio	10500	115000	57000	200012
EC-A/G ELEC. CEDAR ST	12961	846784	97875	3			944659	28300	448500	284300	1705750
PST TESTING	5286	422880		_			472880	12700	208500	128800	772880
P.M.&I.	3600	241200	G				241200	7200	118900	73500	440800
TR GROUP-TR ASSEMBLY	1170	109629	15000	<u>ר</u> ר			124629	3700	58800	37400	224529
TRANSPORTATION	1640	157653	167000				324653	9700	130600	93000	557057
SSO SUPERVISION & TESTING	2000	130872	17600	y a			148472	4500	70100	44600	267672
E.C.C.	100	6500	30000	<b>\</b>			36500	1100	12700	10100	60400
EC-A/G ELEC & RELAY EQUIP WASF	1672	114755	5082	)			119837	3600	58100	36300	217837
MATERIALS AND SUPPLIES		•						3000	50100	50500	21,037
MATERIALS & SUPPLIES			377083				377083	11300	119600	101600	609583
OTHER DIRECT COSTS							C	,	119000	101000	005265
OIL FILL/PERMIT/IND TEST/ABATE				71	6000	179000	185000	5600	58700	49900	299200
ENVIRONMENTAL & MISC			65500		-		65500	2000	20800	17700	106000
ARTICLE 7 CONSULTANT						350000	350000	210500	111000	94300	565800
SURVEYOR/PHOTO/PE SRVC				·		100000	100000	3000	31600	26900	161500
	28429	2030273	5956532	32662	3278576	2365154	13630535	408700	4678400	3743600	22461235
								3	a (	ຄື	11401155
								$\mathbf{O}$		SAY \$	22,461,235
CONCEPTUAL ESTIMATE \$	22,461,235										
OVERHEADS 17 32 & CENTRAL ENCINE.	2 26 4 3		20 A DI	DOX 1 011			•				\$3 787 100
OVERGIERES 17.52 & CENTRAL ENGINE;	J. /0 8 A	⊾ 3; IO	.20 % P	ROLL TAX	A PENS;				TOTAL	OR'S =	\$5,767,100
(\$2,431,500)	( \$619	9,200)	(	\$736,40	0)	(	\$0	)	5.00 %	AFDC =	\$891,300
REMARKS						•					
CENTRAL ENGINEERING	PROJEC	T MANAGER	OR USER	ORGANIZA	TION	CONSTR	UCTION MANAG	ER			
ADDOUGD DY	10000	ים פע		•		10000	100 BY				158
AFFRUVED BI	APPROVE	50 BI				APPROV	/EU BI				100

SHEET 1

CENTRAL ENGINEERING

For Reviewand Comment Onder

APPROP. START / /

START

IS REQUIRED

ENG/DES. START

CONSTR.

OUTAGE

11

11

PROJECT IN SERVICE..... 05/30/2007

COMPL . / /

COMPL . / /

COMPL . / /

START 11/14/2005 COMPL . 05/30/2007

APPROVED BY APPROVED BY Date . Date Date

PROJECT NO21155-04	CENTRAL ENGINEEDING	A D D D D D
BUDGET NO		ENC/DEC
ESTIMATE NO05-4147-AB-03	For Reviewand Common t	ENG/DES.
EST. DATE01/31/2006		U HOYUN

EST.	DATE.		.01/31/2006
		•••	

# PROJ EST. .... SHARAD MALLYA ARA PROJ EST. .... ANTHONY BOSCO ARA

# LOCATION ..... WASHINGTON STREET TO CEDAR STREET STATION WORK

## DESCRIPTION. . 138/13KV TRANSFORMER

		COMPAN	Y		CONTRA	CT	TOTAL	39	OVERHEAD	S 208	
ITEM -	MHRS	LABOR\$	EQ/MATS	MHRS	LABOR\$	EQ/MAT\$	DIRECT	ESCAL	& AFDC	CONTING	TOTAL
PURCHASED EQUIPMENT	······································						·····				
TRANSFORMER 138/13 Cedar St 13KV PHASE SEG BUS Cedar St			1521100				1521100	45600	482300	409800	2458800
FIRE DETECTION FOULP Cedar St			814875				814875	24400	258400	219500	1317175
CT'S REL PANELS ( MICC Coder			293355				293355	8600	92900	79000	474055
RELAY FOULD WASH ST			200000				200000	<b>60</b> 00	63400	53900	323300
PH STAND & SWCR CEDAR ST			33249		-		33249	1000	10500	8900	53649
CIRCUIT SWITCHERS			1721238				1721238	51600	545700	463700	2782238
CONSTRUCTION CONTRACTS			597575				597575	17900	189500	161000	965975
CIVIL CEDAR/WASH ST											
FIRE DET SYST/FIRE PROT Cedar				18813	1953077	1218587	3171664	95100	1005400	854400	5126564
B/G/ELECTRIC CEDAR ST				10805	1037845	436309	1474154	44200	467400	397200	2382954
COMPANY LABOR				2973	281654	81258	362912	10900	115000	97800	586612
EC-A/G ELEC. CEDAR ST	12961	846784	07075								
PST TESTING	5286	422880	91015			14	944659	28300	448500	284300	1705759
P.M.&I.	3600	241200					422880	12700	208500	128800	772880
TR GROUP-TR ASSEMBLY	1170	109629	15000				241200	7200	118900	73500	440800
TRANSPORTATION	1640	157653	167000				124629	3700	58800	37400	224529
SSO SUPERVISION & TESTING	2000	130872	17600				324653	9700	130600	93000	557953
E.C.C.	100	6500	30000				1484/2	4500	70100	44600	267672
EC-A/G ELEC & RELAY EOUTP WASF	1672	114755	50000				36500	1100	12700	10100	60400
MATERIALS AND SUPPLIES	10/2	114755	2002				119837	3600	58100	36300	217837
MATERIALS & SUPPLIES			377083				377092	11200	110600	101000	600500
OTHER DIRECT COSTS							577005	11300	119800	101600	609583
OIL FILL/PERMIT/IND TEST/ABATE				71	6000	179000	185000	5600	58700	49900	299200
ENVIRONMENTAL & MISC			65500				65500	2000	20800	17700	106000
ARTICLE 7 CONSULTANT						350000	350000	10500	111000	94300	565800
SURVEYOR/PHOTO/PE SRVC						100000	100000	3000	31600	26900	161500
	28429	2030273	5956532	32662	3278576	2365154	13630535	408700	4678400	3743600	22461235
										SAY Ş	22,461,235
CONCEPTUAL ESTIMATE	\$ 22,461,235										
						·····	·	<u></u>			

APPROP. START / /

START

OUTAGE IS REQUIRED

ENG/DES. START

CONSTR.

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PROJECT IN SERVICE..... 05/30/2007

COMPL / /

COMPL . / /

11

COMPL .

START 11/14/2005 COMPL . 05/30/2007

OVERHEADS	17.32 % CENTRAL ENGINE;	3.76 %	A & S;	16.28 %	P'ROLL TAX & PENS;			то	TAL	OH'S =	\$3,787,100
	( \$2,431,500 )	(	\$619,200 )	(	\$736,400 )	(	\$O )	5.00	£	AFDC =	\$891,300
REMARKS				·····		· · · · · · · · · · · · · · · · · · ·					

#### CENTRAL ENGINEERING PROJECT MANAGER OR USER ORGANIZATION CONSTRUCTION MANAGER 1581 APPROVED BY APPROVED BY APPROVED BY Date Date Date

#### PRELIMINARY PRINT DATE 01/30/06

# ESTIMATING SECTION REPORT BY GROUP

SHARAD MALLYA

BOSCO

384

GEORGE HERSKOWITZ

ANTHONY

.

SPONS . ENGR:

SUPERVISOR:

ESTIMATOR:

SECTION:

#### CEES.R1 PAGE 1 EST. NO.: 05-4147-AB-03

CHECKED/SIGNED:

1.

2.

BSTIMATE NO.: 05-4147-AB-03 PROJECT NO.: 21155-04 BUDGET NO.: LOCATION NO.: WASH

ACCOUNT NO. :

DISCIPLINE: ELECTRICAL

SUPPORTING:

CC # :

DUE DATE:	01/30/06	LAST	CREATE/UPDATE PERFORMED
PROJECT START:		DATI	: 01/30/06
PROJECT END:		TIM	: 08:46

DESCRIPTION:

WASHINGTON STREET TO CEDAR STREET STATION WORK \*\*\*ORDER OF MAGNITUDE\*\*\* MODELED AFTER GLENDALE 04-4111-AB-00 \*\*\*REVISED 1/30/06\*\*\*

PI	RELIMINARY			estimat	ING SECTION			CEES.R1	PAGE 2
PI	RINT DATE 01/30/06			REPOR	T BY GROUP		OLDEST GRO	EST. NO.: (	05-4147-AB-03
	=======================================	******							, +-
	GROUP DESCRIPTION	TYPE	MANHOURS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	
	***************************************							TOTAL	TOTAL
	BASIS OF ESTIMATE	COMP							
	PE: TRANSFORMER 138/13KV CEDAR ST	COMP				1521100			1621100
	PE: 13KV PHASE SEG BUS Cedar St	COMP				. 814875			814975
	PE: CIRCUIT SWITCHERS	COMP				597575			011075
	PE: 13KV SWITCHGEAR CEDAR ST	COMP				1639750			597575
	PE: POTHEAD STANDS CEDAR ST	COMP				81488			81488
	PE: CT'S,REL PANELS &MISC CEDAR ST	COMP				200000			200000
	PE: FIRE DETECTION SYSTEM CEDAR ST	COMP				293355			200000
	PE:RELAY EQUIP WASH ST	COMP				33249			293335
	CL:RELAY EQUIP WASH ST	COMP	896	60032					33249
	CC:ARTICLE 7 CONSULTANT	CONT							60032
	CC:CIVIL WASH/CEDAR ST	CONT	18813	1952077			350000	350000	350000
XG	CC: B/G BLECTRIC CEDAR ST	CONT	2972	2001054	•		1218587	3171664	3171664
XG	$\#CL \cdot RC = b/C Rt Rombto$		4373	281054	1965		79292	362911	362911
va	CEDAR ST	COMP	12961	846784		91664	6211	6211	944660
	WASHINGTON ST	COMP	776	54723		5082			59805
XG	#CC:BL INSTL FIRE DET SYST	CONT	8238	806845	19	16878	265412	1072277	1089155
	CC: FIRE PROTECTION	CONT	2567	231000			154000	385000	385000
	CL: PST- TESTING	COMP	5286	422880					422880
	CC: P.M. &I.	COMP	3600	241200					241200
X	CL: TR GROUP -TR ASSEMBLY	COMP	1170	109629		15000			241200
KG	CL: TRANSPORTATION	COMP	1640	157653		151000	10000		124629
KG	CL:330 SUPERVIS & TESTING	COMP	2000	120872		121000	16000	16000	324653
				1300/2			17600	17600	148472

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### LEGEND:

G - THE GROUP HAS BEEN PACTORED X - DETAIL COSTS HAVE EXPIRED # - THE GROUP IS INCOMPLETE

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PRI PR	BLIMINA INT DAT	ARY FE 01/	30/06				. BS	TIMATIN REPORT	NG SECTION BY GROUP		OLDEST G	CEES.R1 EST. NO.; ROUP UPDATE 05	PAGE 3 05-4147-AB-03 /25/04
	GROUI	DESC	RIPTIC		GR TYP	P B MANHOUI	RS LA	BOR	EQUIPMENT	Company Material	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL
	CL: E	S.C.C.	*****		COM	P 1(	exementererer DO 6	500	*****************	*************		************************	*********
XG	M&S:	CABLE	CONDU	JIT * MI	C COM	P		16		304797	72271	72271	36500
	ODC:	OIL PI	LL		CON	r					100000	100000	100000
	ODC 1 -	ENVIR	&MISC	ITEMS	COM	<b>?</b>				65500			65500
	ODC : A	SBEST	S ABA	TEMENT	CON	r 7	6	000			4000	10000	10000
	ODC : P	BRMITS	5		COM	p.					25000	25000	25000
	ODC:I	NDEPEN	DANT	TESTING	CONT	2					50000	50000	50000
	CC : 3U	RVEYOR	/рно1	O/PE SRV	C CONT						100000	100000	100000
			*****	COMPAN CONTRA	IY .CT	2842 3266	9 2030 1 3278	290 576	1985	5844434 16878	137082 2321291	137082 · 5601852	8011806 5618730
		** C0	MPANY	TOTAL =		\$8,028,684	CONTRACT	TOTAL	= \$5,601,852	ESTIMATE	TOTAL =	\$13,630,536	* *
BI	<b>DCHK</b> I	F ALL	GRPS:	COMPAN	Y	2842	9 20302	290			137082		2167372
BI	DCHK I	F ALL	GRPS:	CONTRA	CT	3266	1 3278	576	1985		2321291		5601852

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EQUIPMENT COSTS FOR COMPANY GROUPS ARE NOT SHOWN ON THIS REPORT, AS THEY DO NOT APPLY. ON THE ESTIMATE SCREENS, THESE COSTS SHOULD BE IGNORED AND SUBTRACTED FROM ALL COMPANY GROUPS.

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LEGEND:

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G - THE GROUP HAS BEEN FACTORED X - DETAIL COSTS HAVE EXPIRED

PRELIMI	Nary			ESTIMATI	NG SECT	ION			CBBS	.R1 PAG	E 4
PRINT D	ATE 01/30/06	•		REPORT	BY GRO	ŨP		OLDES	EST. T GROUP UPD	NO.: 05-4	147-AB-03
IPERSE	┶╴╴ <sup></sup> ╡╼╧ᆽ╸┵╘╘╕┆╘╕╘┇╘┇╘┍╺┎╗╡╼╒╒┇┇╛					****					
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	Equipment	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
	***************************************			FESSESS	******	*********					
001(10/	19/05) BASIS OF ESTIMATE									*********	
	THE BASIS FOR THIS Estimate is to install a 138/13KV trasnsformer at Cedar Street.										
	THIS ESTIMATE IS BEING PREPARED FOR ARTICLE VII SUBMITTAL THIS IS AN ORDER OF MAGNITUDE EST WITH THE APPROPRIATION ESTIMATE TO FOLLOW.	·									
			******						- The second second		
	COMPANY GROUP SUBTOTAL					·				============	====
010(10/2	27/05) PE: TRANSFORMER 138/13KV	CEDAR S	T								
+1140000	00 TRANSFORMER 65MVA,138/13 LOW NOISE TR	1	LS				1400000			1400000	
+18.65	SALES TAX 8.65	14000	LS				121100			121100	
		********	232228:	===========	*******	**********		**********	***********		
	COMPANY GROUP SUBTOTAL						1521100			1521100	
011(10/2	7/05) PE: 13KV PHASE SEG BUS CEE	DAR ST									
+¥750000	13KV PHASE SEG BUS	1	LOT				750000			750000	
+Y8.65	SALES TAX 8.65	7500	LOT				64875			64875	
*===***=		ia					**********		************	*********	
	COMPANY GROUP SUBTOTAL						814875			814875	



PRELIMINARY PRINT DATE 01/30/06				ESTIMAT REPOR	ING SECT T BY GRO	CEES.R1 PAGE 5 EST. NO.: 05-4147-AB-0 OLDEST GROUP UPDATE 05/25/04					
								0224	I GROOP OF	JAIB 05/25/0	
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	T.ABOR	ROULDWENN	COMPANY	CONTRACT	CONTRACT	======	CONTRACT
*******							MAISRIAL	MATERIAL	TOTAL	TOTAL	PRICI
012(01/30/0	D6) PE: CIRCUIT SWITCHERS						£702202022	2240222222	2223322222	**********	
+¥200000	CIRCUIT SWITCHER CEDAR ST	1	EACH				200000			200000	
+¥200000	CIRCUIT SWITCHBR WASHINGTON STREET	1					200000		-	200000	
+Y100000	CIRCUIT INTERRUPTER	1					100000			100000	
+¥50000	SERVICE ENGINEER	1					50000			50000	
+Y8.65	SALES TAX	5500	LOT				47575			42525	
				**********	*********	*********	**********			C\C\# ============	
	COMPANY GROUP SUBTOTAL						597575			597575	
013(10/27/0	5) PE: 13KV SWITCHGEAR CEDAR	ST									
+Y1500000	13KV SWITCHGEAR INCLUDING SW GR CUBICLE W/13KV CB MISC CUBICLE PT CUBICLE	1	LS				1500000			1500000	
Y8.65	BALES TAX 8.65	15000	LS				129750			129750	
¥10000	ALLOW FOR SERVICE ENGR	1	LS				10000			10000	
	···	*******								10000	
	COMPANY GROUP SUBTOTAL						1639750			1639750	1832652
014(01/30/0	6) PB: POTHEAD STANDS CEDAR	ST									
¥75000	PH STANDS	1	BACH				75000				
Y8.65	SALES TAX	750	EACH				6499			75000	
							0100			6488	
						1328283388		********		**********	======
	COMPANY GROUP SUBTOTAL						81488			81488	

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PRELIMINARY PRINT DATE 01/30/06				ESTIMAT	ING SECT	CEES.R1 PAGE 6					
				REPOR	T BY GROU	JP	EST. NO.: 05-4147-AB-03 Oldest group update 05/25/04				
************		******				95047002003					
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
	***************************************	2022222									
017(10/27/05)	PE: CT'S, REL PANELS &MISC	CEDAR S	T.								
+¥50000	CT'S	3	LOT				150000			150000	
+¥20000	BU RELAY PANELS	1	LOT				20000			20000	
+¥20000	MISC	1	LOT				20000			20000	
+¥10000	TRANSF METERING	1	LOT				10000			20000	
	프로 및 프로 프로 및 프로 해방법 프로 한 번호 및 프로 및 프로 한 번호 방법 )					**********	*********	*******	**********		Techoses
	COMPANY GROUP SUBTOTAL						200000			200000	
019(10/27/05)	PE: FIRE DETECTION SYSTEM (	CEDAR S	т								
	PIRE DET SYSTEM RQUIPMENT SEB GROUP 55 FOR INSTALL										
+¥230000	FIRE PROTECTION PANEL ALISON CONTROL INC. A888-M777-10NBEN	1	LOT				230000			230000	
	AB88 WITH DATA LOGGER ALISON CONTROL INC.	1	BACH								
	ALSO INCLUDED AS PART OF THE EQUIPMENT FURNISHED BY ALISON CONTROLS ARE THE FOLLOWING ITEMS										
+¥40000	2 YEAR GUARANTEE BY MFGR. For service & instruction	1	lot				40000			40000	
	HEAT SENSOR CABLE ALISON 9090 - 13 - 400T ALISON 9090 - 13 - 400T	4000	Feet								
	10 - 4"X 4"X 3" HANDY BOX ALISON 2003K - ST1	10	EACH								

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					· ,							
PRELIMINARY PRINT DATE 01/30/06				estimat Repor	TING SECTION RT BY GROUP		OLDES	CEES.F BST.N T GROUP UPDA1	CEES.R1 PAGE 7 BST. NO.: 05-4147-AB- GROUP UPDATE 05/25/04			
***********		*******		*********		*=========	******	2014年1月11日1日1日1日1日1日		********		
CODB	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE		
019/10/27/05		******		*********		*********	********					
019(10/27/03)	PE: FIRE DETECTION SYSTEM	CEDAR S	T (CONT	··)								
	1300 TYWRAPS-MLT48.8	1300	вусн				•					
	CLAMPS- ALISON# 171091	1300	BACH									
	MANUAL ACTUATE STATION PULL STATION NON CODED	10	Each									
	MISCELLANBOUS DEVICES FURNISHED FOR XFMRS											
	VALVE TAMPER SWITCHES	10	BACH									
	PRESSURE SWITCHES FOR WATERPLOW	10	BACH									
	24 VOLT DC SOLENOIDS	10	BACH			•						
	LOW PRESSURE SWITCH	1	BACH	1 A 1								
	MISCELLANEOUS DEVICES FOR SMOKE DETECTION SYSTEM			•								
	SMORE DETECTORS	40	BACH									
•	HORN STROBES	10	EACH									
VO CE	MANUAL FIRE ALARM STATION	8	BACH									
+10.03	SALKS TAX	2700				23355			23355			
	COMPANY GROUP SUBTOTAL				·	293355		Jac 2 E H # A 2 2 6 9 2	293355	1232322		
21(10/11/05)	PE:RELAY EQUIP WASH ST							-				
¥1000	50/T GE 12PJC14C7A WITH Shorting bar 403A35PI	6	BA			6000			6000			
¥221	AUX/CS GE 12HGA11J52	2	BA			442			442			
									•			

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PRELIMINARY PRINT DATE 01	/30/06			REPOR	ING SECT T BY GRO	CEES.R1 PAGE 8 EST. NO.: 05-4147-AB-03 OLDEST GROUP UPDATE 05/25/04						
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACI UNII PRICE	
	*******		*******		*******			**********	**********	28±≠9#2222		
021(10/11/05)	PE:RELAY BOUIP WASH ST (CO	T.)										
+¥5000	87N/T BASLER BLECTRIC BEI -951-E3B1D1U	.2	BA				10000			10000		
+¥1600	62/T GE SAM 201A1A	2	EA.				3200			3200		
+Y2000	86-4/T BLECTROSWITCH CO SR/LOR #7827LG	2	ea				4000			4000		
+¥600	AUX CT KUHLMAN ELECTRIC ACT645 CAT#A1501840(5/5A)	2	EA				1200			1200		
+¥\$50	AUX CT KUHLMAN ELECTRIC ACT645 CAT#A1503340	2	EA				1100			1100		
+¥200	43/87N/T ABB FT-1 SWITCH	4	EA				800			800		
+¥1000	30/86-4/T P&B R10-T2-W3-J 30 WITH 11 PIN SOCKET	2	EA				2000			2000		
+¥630	30/62/TGB Cat#12nga99ab001f	2	BA				1260			1260		
+¥300	RESISTORS	2	BA			•	600			600		
+ ¥ 8 . 65	SALES TAX	306	LS				2647			2647		
***********		308±±4	9===63					***********				
	COMPANY GROUP SUBTOTAL						33249			33249		
025(10/12/05)	CL:RELAY EQUIP WASH ST											
+H32/67	50/T GB 12PJC14C7A WITH Shorting bar 403A35PI	6	BA	192	12864					12864		
+H32/67	AUX/CB GE 12HGA11J52	. 2	EA	64	4288					4758		
+H32/67	 87N/T BASLER ELECTRIC BEI -951-83B1D1U	2	BA	64	4288					4288		
+H32/67	62/T GE SAM 201A1A	2	RA	64	4288					4288		

PRELIMINARY PRINT DATE 01	1/30/06			ESTIMA Repo	TING SECT	OLDES	CEE: EST 3T GROUP UP!	S.R1 PAG . NO.: 05-4 DATE 05/25/	JE 9 147-AB-03 '04		
	GROUP/LINE	5388 <b>88</b>		********	*******	**********	COMPANY			**********	CONTRACT
CODE	DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	MATERIAL	MATERIAL	TOTAL	TOTAL	UNIT PRICE
=======================================										*****	
025(10/12/05)	CL:RELAY EQUIP WASH ST (CO	. (.ти									
+H32/67	86-4/T BLECTROSWITCH CO SR/LOR #7827LG	2	BA	64	4288					4288	
+H32/67	AUX CT KUHLMAN BLBCTRIC ACT645 CAT#A1501840(5/5A)	2	BA	64	4288					4288	
+H32/67	AUX CT KUHLMAN ELECTRIC ACT645 CAT#A1503340	2	EA	64	4288					4288	
+H32/67	43/87N/T ABB FT-1 SWITCH	4	BA	128	8576					0596	
+H32/67	30/86-4/T P&B R10-T2-W3-J 30 WITH 11 PIN SOCKET	2	EA	64	4288					4288	
+H32/67	30/62/TGE Cat#12NGA99AB001F	2	EA	64	4288					4288	
+H32/67	RESISTORS	2	EA	64	4288					4288	
	COMPANY GROUP SUBTOTAL	******		896	60032		===========	,	25k===aa=	60032	*********
050(10/12/05)	CC:ARTICLE 7 CONSULTANT										
+M350000	ARTICLE 7 CONSULTANT	1	LS		*******			350000	350000	350000	350000.00
	CONTRACT GROUP SUBTOTAL							350000	350000	350000	
051(10/27/05)	CC:CIVIL WASH/CEDAR ST										
	CEDAR STREET ESTIMATE										
+L1598744/104 +M949634	FOR CIVIL EST PLEASE SEE EST 05-4147-HY-31 LABOR MATERIAL	1 1		15373	1598744			949634	1598744 949634	1598744 1 949634	598744.00 949634.00

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E 10 147-AB-03 04	NO.: 05-4 NO.: 05/25/	CEES BST. T GROUP UPI	OLDES		ion Up	TING SECT	ESTIMA Repo	RELIMINARY RINT DATE 01/30/06				
CONTRACT UNIT PRICE	TOTAL	CONTRACT TOTAL	CONTRACT MATERIAL	COMPANY MATERIAL	EQUIPMENT	LABOR	MANHRS	T UNIT	QUAN	GROUP/LINE DESCRIPTION	CODE	
					*********			=======			************	
									NT.)	) CC:CIVIL WASH/CEDAR ST (CC	051(10/27/05)	
354333.00 268953.00	354333 268953	354333 268953	268953			354333	3440		1 1	FOR CIVIL EST PLEASE SEE EST 05-4147-HY-32 Labor Material	+L354333/103 +M268953	
								******	2220221			
	3171664	3171664	1218587			1953077	18813			CONTRACT GROUP SUBTOTAL		
			1.10							CC: B/G ELECTRIC CEDAR ST GROUP FACTORS: NO DISTRIBUTION MANHOLE REQUIRED SOME CONDUIT	053(10/27/05)	
										PREVIOUSLY INSTALLED 6" PRE COND BELOW GRADE		
8.80	14080 14112	14080 14112	14080			14112	144	feet Feet	1600 1600	CONDUIT, FRE, 6" 6540-6000 CONDUIT, FRE, 6" 6540-6000	+M8 +H.09/98	
8.80 58.80	1408 9408	1408 9408	1408			9408	96	EACH EACH	160 160	COUPLING, FRE, 6"6540-6010 COUPLING, FRE, 6"6540-6010	+M8 +H.6/98	
132.00 147.00	1320 1470	1320 1470	1320			1470	15	BACH EACH BACH	10 10 10	BLBOW, FRE, 90 DEG, 6"X60" BLBOW, FRE, 90 DEG, 6"X60" BLBOW, FRE, 45 DEG, 6"X60"	+M120 +H1.5/98 +M85	
93.50 147.00	1470	1470	333			1470	15	EACH	10	BLBOW, FRE, 45 DEG, 6"X60"	+H1.5/98	
77.00 171.50	770 1715	770 1715	770			1715	18	BACH BACH	10 10	ELBOW, FRE, 22.5 DEG, 6"X60" ELBOW, FRE, 22.5 DEG, 6"X60"	+M70 +H1.75/98	
44.00 171.50	440 1715	440 1715	440			1715	18	BACH BACH	10 10	ELBOW, FRE, 11.25 DEG, 6X36" ELBOW, FRE, 11.25 DEG, 6X36"	+M40 ⊧H1.75/98	
66.00 98.00	792 1176	792 1176	792			1176	12	BACH BACH	12 12	6" FRE FE ADAPT, CAP & PLUG 6" FRE FE ADAPT, CAP & PLUG	►M60 ►H1/98	
17.15	5489	5489	892			4597	47	PBET	320	COMMUNICATIONS CONDUIT CONDUIT, PVC, UNDER GR,4"	16.90/98/85	

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PRELIMINARY PRINT DATE 01/30/05				estima	TING SECTI	ON			CEES	.R1 PAG	E 11
PRINT DATE 0	1/30/06			REPO	RT BY GROU	P		OLDES	EST. T GROUP UND	NO.: 05-4	147-AB-03
			2322325								<i></i>
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR 1	Souipment	COMPANY MATERIAL	CONTRACT	CONTRACT	********	CONTRACT UNIT
								TALSKIND	TOTAL	TOTAL	PRICE
053(10/27/05)	CC: B/G ELECTRIC CEDAR ST GROUP FACTORS:	(CONT.	)		2234228422	********		2332£26528		49\$P6#22269	
	PRELIMINARY DESIGN							1.10			
+10.6/98/85 +13.75/98/85 +16.90/98/85	ALLOW FOR CONTROL/ PROT UNDERGROUND PVC CONDUIT CONDUIT, PVC, UNDER GR, 2" CONDUIT, PVC, UNDER GR, 3" CONDUIT, PVC, UNDER GR, 4"	700 620 1100	FBBT FRET FBET	64 74 161	6307 7246 15802			1224 1407 2052	7531 8653	7531 8653	10.76 13.96
+H1/98/21 +H1.5/98/64 +H2/98/91	NO DESIGN FOR A/G PACKAGE RGS 90 FROM PVC UG TO AG 2" RGB BLBOW 3"RGS BLBOW 4" RGS BLBOW	22 34 4	BACH BACH BACH	22 51 8	2156 4998 784			508 2394	2664 7392	2664 7392	17.15 121.10 217.40
+M9.39 +M17.78 +M26.38 +H.5/98	2" PE ADAPT, CAP & PLUG 3" FE ADAPT, CAP & PLUG 4" FE ADAPT, CAP & PLUG INSTALL ADAPTERS & PLUGS	16 28 4 48	BACH BACH BACH BACH	24	2352			165 548 116	1184 165 548 116	1184 165 548 116	296.10 10.33 19.56 29.02
UE0101306500 UE0101310500 UE0121006500 UE0121010500 UE0122006500 UE0122010500	CONDUIT, RGS, ON GRADE, 2" CONDUIT, RGS, ON GRADE, 4" CONDUIT BEND, 2" CONDUIT BEND, 4" CONDUIT OFFSET, 2" CONDUIT OFFSET, 4"	580 740 18 36 26	* LF * LF * EA * EA * EA	134 296 23 45 31	11828 26120 1987 3974 2756			2966 16406	2352 14793 42526 1987 3974 2756	2352 14793 42526 1987 3974 2756	49.00 25.51 57.47 110.40 110.40
UE0131106900 UE0131110500	CONDUIT COUPLING, BXP, 2" CONDUIT COUPLING, BXP, 4"	22 36	*EA *EA	88 20 46	7773 1747 4038			89 593	7773 1836 4631	7773 1836 4631	194.33 83.45 128.64
L150010 UC0120104900 UC0120116800	GENERAL CONDITIONS SUPERVISION- 2MHS/WEBK 2 X 150 = 300 ELECTRICIAN, JOURNEYMAN TRAILER, 8'X26', W/TOILET SANITARY UNIT, TEMP TOILET 	300 26 26	*HOUR *WK *WK	300	26367	1612 354			26367 1612 354	26367 1612 354	87.89 62.00 13.60

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ALLOW FOR GROUNDING

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PRBLIMINARY				BSTIMAT	ING SECT	ION			CEES	.R1 PAG	E 12	
PRINT DATE UI	/30/06			REPOR	T BY GROU	JP		OLDESI	GROUP UPD	ATE 05/25/	147-AB-03 04	
	***************************************		*****		********		4023822222	*****				
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE	
===================			*==**									
053(10/27/05)	CC: B/G BLECTRIC CEDAR ST GROUP FACTORS:	(CONT.)						1.10				
	BASED ON SIMILAR JOB											
+M2.50 +H.052/98	CABLE, BARE, AG, 1/C4/0, 679 CABLE, BARE, AG, 1/C4/0, 679	2000	PBBT FBBT	104	10192			5500	5500 10192	5500 10192	2.75	
+M3.50 +H.110/98	CABLE, BARE, UG, 1/C500MCM CABLE, BARE, UG, 1/C500MCM	3000 3000	PBET PEET	330	32340			11550	11550 32340	11550 32340	3.85	
+M30 +H3.15/98	CADWELD, TA, 750X750X500 CADWELD, TA, 750X750X500	20 20	EACH EACH	63	6174			660	660 6174	660 6174	33.00	
+M15 +H3/98	CADWELD, TA, 500X500X500 CADWELD, TA, 500X500X500	40 40	BACH BACH	120	11760			660	660 11760	660 11760	16.50	
+M14 +H3/98	CADWELD, TA, 500X500X4/0 CADWELD, TA, 500X500X4/0	16 16	BACH ÈACH	48	4704			246	246 4704	246 4704	15.40	
+M13 +H2.5/98	CADWELD, TA, 4/0X4/0X4/0 CADWELD, TA, 4/0X4/0X4/0	4 4	EACH EACH	10	980			57	57 -98 D	57 980	14.30 245.00	
+M65 +H1/98	MECH GRD P CLAMP,4/0X4/0 MECH GRD P CLAMP,4/0X4/0	4	BACH EACH	- 4	392			286	286 392	286 392	71.50 98.00	
+M12 +H1.5/98	COIL AND TAPE ENDS ALLOW FOR CORE DRILL THRU EXISTING CONCRETE TRENCHES FOR PVC	68 68	BACH EACH	102	9996			898	898 9995	898 9995	13.20 147.00	
+M6 +H2.5/98	CORE DRILL 4"DIA, 12"D CORE DRILL 4"DIA, 12"D	14 14	BACH RACH	35	3430			92	92 3430	92 3430	6.60 245.00	
+M10 +H3/98	CORE DRILL 6"DIA,12"D CORE DRILL 6"DIA,12"D	2	each Each	6	588			22	22 588	22 588	11.00	
+H200/98	GENERAL CONDITIONS FOR SUBCONTRACTED WORK SUPERVISION-5 MHRS/WBBK 5 X 40 = 200 ELECTRICIAN, JOURNEYMAN	2	lot	400	39200				39200	39200	19600.00	

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PRELIMINARY PRINT DATE 01/30/06			ESTIMATING SECTION						CEES.R1 PAGE 13				
PRINI DAIE U.	1/30/06			REPOI	RT BY GROU	<b>P</b>		OLDES	EST T GROUP UP	. NO.: 05-43 DATE 05/25/0	L47-AB-03		
		*==***	******										
CODR	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE		
			3235552			********							
053(10/27/05)	CC: B/G ELECTRIC CEDAR ST GROUP FACTORS:	(CONT.	)										
+M3000	TRAILER,8'X26',W/TOILET 40 WEEKS @ \$75/WEEK	2	LOT					6600	6600	6600	3300.00		
+M1000	SANITARY UNIT, TEMP TOILET 40 WEEKS @ \$25/WEEK	2	LOT					2200	2200	2200	1100.00		
************													
						**********	**********	**********		***********	20322222		
	CONTRACT GROUP SUBTOTAL			2973	281654	1966		79292	362911	362911			
054(10/27/05)	CL:EC - A/G ELECTRIC CEDAR GROUP PACTORS:	ST			0.75		1.21	1.09			•		
+H112/98	ASSIST IN RIGGING MAIN TANK ON CENTER LINES, RAD- IATORS & MISC COMPONENTS ELECTRICIAN, JOURNEYMAN	1	HOTTP	110	1000								
+H56/98	UNLOAD/UNCRATE/STORE TRANSF COMPONENTS BLECTRICIAN JOURNEYMAN		HOUR		8232					8232			
·	·	Ŧ	HOUR	56	4116					4116			
+H420/98	MECH/ELEC ASSEMBLY, TRANSF ELECTRICIAN, JOURNEYMAN DRYOUT/OILFILLING	1	HOUR	420	30870		•			30870			
+H336/98	BLECTRICIAN, JOURNEYMAN	1	HOUR	336	24696					••••			
	INSTALL INTERRUPTER		3		24050					24696			
+H48/67	INSTALL INTERRUPTER	1	LS	48	2412					2412			
UB1202102800 * UE0951303800 UE0951304800 UE0953401800 UE0961002800 * +Y350 +H48/98	INSTALL CIRCUIT SWITCHER SUP STRU,AL,DISC SW,138KV DISC SW,138KV,3P,SET UP DISC SW,138KV,3P,INSTALL MO,DISC SW,138KV/345KV GROUND SW,138KV,3P INST FLEX CABLE,1172MCM ELECTRICIAN,JOURNBYMAN	2 2 2 2 2 2 12 2	* EA * EA * EA * BA * BACH BACH HOUR	144 48 161 32 140	9559 3183 10656 2382 9284 7056		5082			9559 3183 10656 2382 9284 5082			
	•	-		20	.050		•			7056			

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#### LEGEND:

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\* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

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PRELIMINARY PRINT DATE 01/30/06				ESTIMAT	ING SECT	ION	•	CEES.R1 PAGE 14 BST. NO.: 05-4147-AB-03			
PRIMI DAIA U	1/30/06			REPOR	T BY GRO	ŪP		OLDES	T GROUP UPDI	TE 05/25/04	1/-AB-03
	***************************************						*******				
CODE	GROUP/LINB DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	ONTRACT UNIT PRICE
			=======								
054(10/27/05)	CL:EC - A/G ELECTRIC CEDAR GROUP FACTORS:	ST (CO	NT.)		0.75		1.21	1.09			
UE3208510500 UE3208530500 UE3208550500 UE1201102500	POTHBAD STAND BCB, BRECT SCAPP'D, 6M@8HR BCB, POTH STD SUPPT, 6M@8HR BCB, REM SCAFF'DING, 6M@8HR PH STAND, AL, DOUBLE, 138KV	4 4 2	*SET *SET *SBT *EACH	192 192 192 108	6674 6674 6674 7173					6674 6674 6674 7173	
+M60 +H48/98	INSTALL TRANSITION BOX *BLECTRICIAN, JOURNBYMAN	2 1	BACH HOUR	64	4692			131	131	131 4692	
L150010	CONTROL CABINETS ELECTRICIAN, JOURNEYMAN	32	*HOUR	32	2366					2365	
+¥250	INSTALL POTHEAD TERMINAL BOXES & PRESSURE GAUGES	1	LS				303			303	
L150010	BLECTRICIAN, JOURNEYMAN	32	*HOUR	32	2366					2266	
L150010 +Y5000	BACK UP RELAY PANEL Electrician, Journeyman Extend U/G Conduit	48 2	*HOUR EA	48	3549		12100			3549 12100	
+Y50 +H2/94/20	INSTALL XFMR PULL BOX CUT OPENING	· 1 16	ls Ea	32	2256		61 387			61 2643	
+H12/98/100 +H32/98/10	INSTALL TRANSITION BOXES TERMINAL BL/ KO/ FITTGS	1	BA Ba	12 32	882 2352		121 12			1003 2364	
+Y18 L150010	INSTALL FLEX CABLES ELECTRICIAN, JOURNEYMAN	18 36	EA *HOUR	36,	2662		392			392 2662	
+H60/98/3000	PULL BOX CIRCUIT SWITCHER TERMINAL BL/ KO/ FITTGS	1	BA	60	4410		3630			8040	
L150010 UE3208075900 UE3208130800	FO IMUX ELECTRICIAN, JOURNEYMAN MCUT, PULL FO CAB, 24F FO PATCHPANEL, 12PORT	32 700 2	*HOUR *FT *EA	32 56 8	2366 2682 594		737			2366 3419 594	
+H48/98	RIG IN / ASSEMBLE SWGR SECTS SWGR,13KV, 1-CUB SECTION	9	BACH	432	31752					31752	

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LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY			ESTIMA	FING SECT	ION		CEES.R1 PAGE 15				
PRINT DATE 0	1/30/06			REPOI	RT BY GRO	UP		OLDES	EST. T GROUP UPD	NO.: 05-41 ATE 05/25/0	147-AB-03 04
3622222666698											
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
		******		*********	20200000	***********	*********				
054(10/27/05)	) CL:EC - A/G ELECTRIC CEDAR GROUP FACTORS:	ST (CO	NT.)		0.75		1.21	1.09			
+H15/98	INSTALL 13KV PH SEG BUS APPX 270' / 15 MHR/FT	270	LF	4050	297675					297675	
+Y5000 UE0904111500 +Y1000	SCAFFOLD/LIFTS ETC BUS CONN, SWGRSBC, TO 2000A MISC MTLS	1 20 1	LS *EACH LOT	322	23894		6050			6050 23894	
+H1/98/62 +H.3/98/6	NO DETAILS TRAY INSTALLATION CONDUIT INSTALLATION	300 1000	EA Ba	300 300	22050 22050		22506			1210 44556	
UE0265320S00 UE0265510S00 UE0205024S00 UE0265220S00 UE0265120S00 UE0205000S00 UE0204014S00 UE0204014S00	CONTROL CABLE CABLE,7C12,7886/7886C CABLE,19C12,7784C CABLE,600V,12C12,7887C CABLE,4C12,7885C CABLE,4C12,7885C CABLE,600V,1C12,7884C CABLE,600V,2C16,7811C CABLE,14C18,7880C CONNECTIONS CONNECTIONS	686 800 10800 5000 9860 1200 4200 100	*LF *LF *LF *LF *LF *LF *LF	19 38 454 120 177 13 67 2	1357 2770 33831 9068 13005 989 4847 165		13 19 161 76 67 1 11 11			29310 1370 2789 33992 9143 13072 990 4858 166	
UE0301105500 UE0301106500	CONN, 600V, CONTROL, 12 CONN, 600V, CONTROL, 18 CONN, 600V, CONTROL, 16	1500 28 28	*BA *BA *BA	525 8 8	34749 582 582			556 6 6	556 6 6	35305 588 588	
UE0205057800 UE0265820800 UE0265920800 UE0301309800	CABLE,600V,2C10,7890 CABLE,4C10,7891C CABLE,7C10,7805/7805C CONNECTION,600V,POWER,10	1200 600 9860 250	*LF *LF *LF *8A	13 14 306 125	989 1088 22758 9275		886 5 179	534	534	1875 1093 22937 9809	
UE0267620300 UE0267120300 UE0266220300 UE0301318300 UE0301316300 UE0301311300	CABLE, 1C4/0,7894/7894C CABLE, 1C2/0,7893/7893C CABLE, 1C2/0,7893/7893C CABLE, 1C6,7803/7803C CONNECTION,600V, POWER,4/0 *CONNECTION,600V,POWER,2/0 CONNECTION,600V,POWER,6	4800 4000 2400 16 16 8	* LF * LF * LF * BA * BA * EA	202 132 48 16 32 4	15036 9892 3561 1189 2379 297		104 86 17	465 340 17	465 340 17	15140 9978 3578 1654 2719 314	
+Y300 +H12/98 +Y345	VAULT LIGHTING-NO DETAILS FIXTURE, HPS, 100W BLECTRICIAN, JOURNEYMAN FIXTURE, HPS, 100W+BOX&GURD	4 12 1	HOUR HOUR	144	10584		1452 417			1452 10584 417	

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PRBLIMINARY PRINT DATE 01/30/06				ESTIMA REPO	TING SECT	ION	CEES.R1 PAGE 16 EST. NO.: 05-4147-AB-03 OLDEST GROUP UPDATE 05/05/04				
		828222						OLDES	T GROUP UPD	DATE 05/25/0	04
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EOUIPMENT	COMPANY MATERIAL	CONTRACT	CONTRACT		CONTRACT
************	*************************									TOTAL	PRICE
054(10/27/05)	CL:EC - A/G ELECTRIC CEDAR GROUP FACTORS:	ST (CO	NT.)	*******	0.75		1.21				********
+H4/98 UE0811006500 UE0821306500 UE0102102500 UE0265010500	BLECTRICIAN, JOURNEYMAN SWITCH, TOGGLE, 1P15A120V PL,WTTGT, RECEPT/SW, 1G-FS CONDUIT, AL, EXPOSED, .75" CABLE, 1C12, 7156C	4 2 250 1000	HOUR *BA *BA *LF *LF	16 1 40 11	1176 45 22 2968 824		121	19 41 445	19 41 445	1176 63 63 3413	
+H54/98/1000 IE4001631S00 IE4001621S00 IE4001661S00 IE4001691S00 IE4001721S00	ALLOW FOR A/G GROUNDS GROUND TRANSFORMER MGRD W/CABLE,SWGR EQ,750 MGRD W/CABLE,POTHEAD STRU MGRD W/CABLE,GPAD,TRANSF MGRD W/CABLE,BUS DUCT,750 MGRD W/CABLE,DS&STRUC,750	1 9 4 6 4	*DET *DET *DET *DET *DET	54 41 15 89 24 16	3969 3036 1123 6606 1752 1159		1210 4263 1762 2643 2643 1762	310 561 1155 863 762	310 561 1155 863 762	5179 7609 3446 10404 5258 3683	
+15000/98/50	OIL WATER SEP SIGNALS WELDER	1		77	5625		9075			14700	
E1814010 +10000/90	WELDER,400AMP,56HP SCAFFOLD/ MANLIFT /RENTAL TAGGING -ALLOW	500 1	*HOUR	67	4500		4840			9340	
L150010	ELECTRICIAN, JOURNEYMAN		*HOUR								
L580730	MNT&CONST, ELEC. CONST (BCB)	800	*HOUR	800	27810					27810	
1580730	GEN CONDITIONS/ MOB/DEMOB MNT&CONST, ELEC.CONST(ECB) CLEANUP	320	*HOUR	320	11124					11124	
L580730	MNT&CONST, BLEC.CONST(ECB) OUTAGE COORDINATION	200	*HOUR	200	6953					6953	
L580730	MNT&CONST, BLEC.CONST(ECB)	600	*HOUR	600	20858					20858	
	COMPANY GROUP SUBTOTAL			12961	846784		91664	 6211	======================================	944660	2220202

PRELIMINARY PRINT DATE O	1/30/06			BSTIMA	TING SECT	ION		•	CEBS EST.	NO.: 05-4	GB 17 4147-28-03
				REPO:	RT BY GROU	J.P.		OLDES	T GROUP UPD	ATE 05/25,	/04
CODB	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
					*********			TARRADEES	 BBENEDESSES		
060(10/27/05)	CL:BC - A/G BLECTRIC WASHI GROUP FACTORS;	NGTON S	BT		0.75		1,21	1.09			
	INSTALL GRD SWITCH										
UE1202102800 UE0951303800 UE0951304800	SUP STRU, AL, GRD SW, 138KV GRD SW, 138KV, 3P, SET UP GRD SW, 138KV, 3P, INSTALL	. 1 1 1	ea Ra Ea	50 24 80	4105 1955 6543					4105 1955 6543	
UB1202102S00 UB0951303S00 UB0951304S00 UB0953401S00 UB0961002800 +Y350 +H48/98	INSTALL CIRCUIT SWITCHER *SUP STRU, AL, DISC SW, 138KV DISC SW, 138KV, 3P, SET UP DISC SW, 138KV, 3P, INSTALL MO, DISC SW, 138KV, 345KV *GROUND SW, 138KV, 3P INST FLEX CABLE, 1172MCM ELECTRICIAN, JOURNEYMAN	2 2 2 2 2 2 12 2 2	* EA * EA * EA * EA * EACH EACH HOUR	144 48 161 32 140 96	9559 3183 10656 2382 9284 7056		5082			9559 3183 10656 2382 9284 5082 7056	
************	*	******									
	COMPANY GROUP SUBTOTAL			776	54723		5082		==============	59805	### <b>#</b> E2# <b>#</b> #
070(10/27/05)	CC:EL INSTL FIRE DET SYST GROUP FACTORS:						1.21	1.09			
+500000/98	DELUGE SYSTEM INSTALLATION OF FIRE DETECTION EQUIPMENT WITH ASSOCIATED CONDUIT AND WIRE	. 1	LS	3061	300000	·		218000	518000	518000	518000.00
+H64/98	FIRE PROTECTION PANEL NEMA 12	1	BA	64	6272				6272	6272	6272.00
+H64/98	REMOTE ANNUNCIATOR PANEL NEMA 12	1	BA	64	6272				6272	6272	6272.00
+H.020/98	HEAT SENSOR CABLE TO BE WRAPPED AROUND XFMR	4000	FBBT	80	7840				7840	7840	1.96
+H.01/98	TYWRAPS WITH CLAMP	1300	PEET	13	1274				1274	1274	0.98

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LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

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PRELIMINARY				BSTIMA	TING SECT	ION	CBES.R1 PAGE 18				
PRINT DATE 01	1/30/06			REPO	RT BY GRO	UP		OLDES	T GROUP UP	. NO.: 05-4: DATE 05/25/	147-AB-03 04
***********		******	9 8 2 2 2 5 5	********						***********	
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
			******							·····	
070(10/27/05)	CC:EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.	)				1.21	1.09			********
+H2/98	MANUAL ACTUATE STATION	10	BACH	20	1960				1960	1960	196.00
+H2/98	VALVE TAMPER SWITCHES	10	EACH	20	1960				1960	1960	196.00
+H2/98	PRESSURE SWITCHES FOR WATERFLOW	10	each	20	1960				1960	1960	196.00
+H1/98	24 VOLT DC SOLENOIDS	10	BACH	10	980				.980	980	98.00
+H4/98	LOW PRESSURE SWITCH	1	BACH	4	392				392	392	392.00
+H.6/98	1900 BOX AND COVER MISCELLANEOUS DEVICES FOR SMOKE DETECTION SYSTEM	90	BACH	54	5292				5292	5292	58.80
+H2/98	SMOKE DETECTORS	40	BACH	80	7840				7840	7840	196 00
+H2/98	HORN/STROBE	10	Bach	20	1960				1960	1960	196.00
+H3/98	MANUAL FIRE ALARM STATION	8	BACH	24	2352				2352	2352	294.00
	ALL CONDUIT, CABLE AND TERMINATION QUANTITIES ARE ESTIMATED AS NO DEFINITIVE INFORMATION IS AVAILABLE			·							
	CONDUIT AND CABLE RUN BETWEEN XFMR SYSTEMS AND MAIN FIRE PROT PANEL 10 RUNS © 300 LF BACH										
UE0101202S00	CONDUIT, RGS, POWERHSE, .75"	12000	*LF	2292	226874			23246	250120	250120	20.84
UE0264730500 UE0205009500 UE0301107500 UE0301108500	CABLE, 2C14, 7711C CABLE, 600V, 2C12, 7871 CONN, 600V, CONTROL, 14 CONN, 600V, CONTROL, 12	3200 9600 40 120	* FEET * FEET * BACH * BACH	42 154 11 42	4220 14772 1108 4155		2904 9293	9 44	4220 14772 1117 4200	7124 24065 1117 4200	1.32 1.54 27.93 35.00

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LEGEND: \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

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PRELIMINARY				BSTIMAT	ING SECT	ION			CBES	.R1 PAGE	: 19
PRINT DATE 01	/30/06			REPOR	T BY GRO	UP		OLDES	EST. T GROUP UPD	NO.: 05-41 ATE 05/25/0	47-AB-03
			******			**********				******	30003335
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	Contract Material	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
	***************************************			******		FERRERE					
070(10/27/05)	CC:EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.	)				1.21	1.09			
	CONDUIT AND CABLE RUNS BETWEEN XFMR DETECTION SYSTEM AND TRANSFORMERS 10 RUNS @ 300 LF EACH										
UE0101202500	CONDUIT, RGS, POWERHSE, .75"	3000	* Fret	573	56719	•		5811	62530	62530	20.84
+M.50 +H.025/98 UB0301106500 +M5 +H.75/98	2/C #16STP 2/C #16STP CONN,600V,CONTROL,16 SHIELDS SHIELDS	3200 3200 40 10	FEET FEET *Bach Bach Bach	80 11 8	- 7840 1108 735			1744 9 55	1744 7840 1117 _55	1744 7840 1117 55	0.55 2.45 27.93 5.45
	CONDUIT AND CABLE RUN BETWEEN STATION ALARM PANEL AND MAIN FIRE CONTROL PANEL	20	<u>DACI</u>	0					. 735	735	73.50
UE0101205500	CONDUIT, RGS, POWERHSE, 1.5"	200	* PBET	62	6156			758	6914	6914	34.57
UB0205037500 UB0301108500	CABLE, 600V, 27C12, 497J CONN, 600V, CONTROL, 12	200 54	*Fert *Bach	28 19	2726 1870		2180	20	2726 1890	4906 1890	13.63
	CONDUIT AND CABLE RUNS BETWEEN STATION ALARM PANEL AND MAIN FIRE ALARM CONTROL PANEL										
UB0101202500	CONDUIT, RGS, POWERHSE, .75"	150	*LF	29	2836			291	3127	3127	20.84
UB0205009800 UB0301108500	CABLE, 600V, 2C12, 7871 CONN, 600V, CONTROL, 12	340 8	*lf *ba	5 3	523 277		329	. 3	523 280	852 280	1.54
	CONDUIT AND CABLE RUNS BETWEEN LOW CITY WATER PRESSURE SWITCH AND MAIN FIRE ALARM CONTROL PANEL			·	·						
<b>UE0101202500</b>	CONDUIT, RGS, POWERHSE, .75"	200	* Feet	38	3781		. •	387	4169	4169	20.84
UE0264730500	CABLE, 2C14, 7711C	220	* FERT	3	290		200		290	490	1.32

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PRELIMINARY				ESTIMAT	ING SECT	ION	CEES.R1 PAGE 20				
PRINT DATE 01	PRINT DATE 01/30/06			REPOR	T BY GRO	UP		OLDES	BST. T GROUP UPI	NO.: 05-4: DATE 05/25/	147-AB-03 04
						*********		**********			
CODB	GROUP/LINE DESCRIPTION	QUAN	T UNIT	Manhrs	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
	***************************************										
070(10/27/05)	CC: EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.)	)				1.21	1 09			
UB0301107500	CONN, 600V, CONTROL, 14	4	*BACH	1	111			1.09	112	112	27:93
UE0101202500	CONDUIT AND CABLE RUNS BETWEEN REMOTE ANNUNCIATR PANEL & MAIN CONT'L PANEL CONDUIT, RGS, POWERHSE, .75"	150	*PBET	29	2836			291	21.07		
+M.5 +H.025/98	2/C #16 STP 2/C #16 STP	170 170	FEET BACH	4	417			93	.93	93	20.84
UB0301106S00 +M5 +H.75/98	CONN,600V,CONTROL,16 SHIBLDS SHIBLDS	4	*BACH BACH	ī	111			1 5	417 112 5	417 112 5	2.45 27.93 5.45
	AC AND DC POWER FBEDERS TO MAIN FIRE CONTROL PANEL	-	BACA		74				74	74	73.50
UE0101202900	CONDUIT, RGS, POWERHSE, .75"	400	*FEET	76	7562			775	8337	8337	20.84
	CONDUIT AND CABLE RUNS BETWEEN FIRE PUMP CONTROLLER AND PUMP STARTER TO MAIN FIRE CONTROL PANEL				·						
UE0101202800	CONDUIT, RGS, POWERHSE, .75.	250	* FBET	48	4727	·		484	5211	5211	20.84
UE0204054500 UE0301107500	CABLE, 600V, 1C14, 7155C CONN, 600V, CONTROL, 14	2500 20	*lf *Bach	28 6	2748 554		242	Ś	2748	2990	1.10
	CONDUIT AND CABLE RUNS FOR FIRE ALARM MANUAL STATIONS TO MAIN FIRE CONTROL PANEL							_			
UE0101202500	CONDUIT, RGS, POWERHSE, .75"	400	*LF	76	7562			775	8337	8337	20.84
UE0264730500 UE0301107500	CABLE, 2C14, 7711C CONN, 600V, CONTROL, 14	1000	LF BA	13 11	1319 1108		908	9	1319 1117	2226 1117	1.32
	CONDUIT AND CABLE RUNS										

PRELIMINARY				ESTIMA	TING SECT		CER	S.R1 PA	.GE 21		
PRINT DATE 01	/30/06			REPO	RT BY GRO	ŪP		OLDES	ESI ST GROUP UP	C. NO.: 05- PDATE 05/25	4147-AB-03 /04
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
070(10/27/05)	CC:EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.	)				1.21	1.09		*********	
	FOR AUDIBLE/VISUAL ALARMS Horns and Strobes to Main Fire Control Panel			· .							
UE0101202500	CONDUIT, RGS, POWERHSE, .75"	800	*LF	153	15125			1550	16675	16675	20,84
UE0205009500 UE0301108500	CABLE, 600V, 2C12, 7871 CONN, 600V, CONTROL, 12	850 40	*LF *BA	14 14	1308 1385		823	15	1308 1400	2131 1400	1.54
	CONDUIT AND CABLE RUNS FOR SMOKE DETECTORS TO MAIN FIRE CONTROL PANEL										55100
UE0101202500	CONDUIT, RGS, POWERHSE, .75"	1250	*LF	239	23633			2421	26054	26054	20.84
+M.6 +H.018/98 +H.33/98	FIRE ALARM CABLE FIRE ALARM CABLE FA CABLE TERMINATIONS	1500 2500 60	FEBT	45	4410 1940	·		981	981 4410 1940	981 4410 1940	0.65
+H200/9B	LOST TIME DUE TO PERIODS OF OUTAGES	1		200	19600				19600	19600	19600.00
+H4/98/100	ALLOW FOR PENETRATIONS	20		80	7840			2180	10020	10020	501.00
+L98/98 UC0110101500 UC0110115500 +L4000	GEN CONDITIONS MOB/DEMOB CLEANUP,1 MHR/DAY CLEANUP,FINAL HASP	96 120 1 1	*DAY *DAY	96 132 20	9408 9330 1393	19			9408 9330 1412	9408 9330 1412	98.00 77.75 1412.23
+M5000	SCAFF/LIFTS EQ RENTALS	1						5450	5450	5450	5450.00
	CONTRACT GROUP SUBTOTAL	*==****		8238	806845	19	16878	265412	·1072277	1089155	
102(10/25/05)	CC: FIRE PROTECTION										
+135000/90 +150000/90 +100000/90	A/G FIRE FOR TRANSFORMERS RING PIPING/ SPRAY NOZZLE HEADER PIPING & MODS FIRE PUMP & ASSOC EQUIP	1 1 1	bank Bank Bank	900 1000 667	81000 90000 60000	81		54000 60000 40000	135000 150000 100000	135000 150000 100000	135000.00 150000.00 100000.00
	CONTRACT GROUP SUBTOTAL			2567	231000			154000	385000	385000	

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PRELIMINARY PRINT DATE 01			ESTIMAT REPOR	ING SECT	ION TP	CEES.R1 PAGE 22 EST. NO.: 05-4147-AB-03 OLDEST GROUP UPDATE 05/25/04					
CODB	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
130(10/12/05)	CL: PST- TESTING		******		22002225:		**********		***********		*******
+H5286/80	S&TO, PROT SYS TEST (PST)	1	LS	5286	422880					422880	
	COMPANY GROUP SUBTOTAL			5286	422880					422880	
132(10/08/04)	CC: P.M. &I.										
+L67/67	PM & I. 30 WEEKS @ 40 HOURS/WEEK X 3 MEN	3600	HOUR	3600	241200					241200	
************	= = = = = = = = = = = = = = = = = = = =			*********			=======================================	**********	***********		
	COMPANY GROUP SUBTOTAL			3600	241200					241200	
150(06/22/04)	CL: TR GROUP - TR ASSEMBLY							•			
L150010	ASSIST IN RIGGING MAIN TANK ON CENTER LINES,RAD- IATORS & MISC COMPONENTS ELECTRICIAN,JOURNEYMAN	450	HOUR	450	42165					42165	
L150010	UNLOAD/UNCRATE/STORE TRANSF COMPONENTS BLECTRICIAN, JOURNEYMAN	90 <del>*</del>	HOUR	90	8433					8433	
L150010 +Y15000	OIL FILL/DRYOUT BLECTRICIAN, JOURNBYMAN PERRONOL RIG RENTAL	630 * 1	HOUR	630	59031		15000			59031 15000	
		*******	377225		28022382			********	**********		
	COMPANY GROUP SUBTOTAL			1170	109629		15000			124629	

LEGEND: \* - (BEFORE UNIT OF MEASURB) THE LINE HAS EXPIRED COSTS

PRBLIMINARY PRINT DATE 01/30/06				ESTIMAT	ING SECT	ION	CBES.R1 PAGE 23				
				RBPOF	T BY GROU	Ţ₽		OLDEST GROUP UPDATE 05/25/04			
СОДВ	GROUP/LINE DESCRIPTION	QUANT	UNIT.	MANHRS	LABOR	RQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
			******	*********				**********			=========
212(10/11/05)	CL: TRANSPORTATION GROUP FACTORS:			. ·	1.53						
L580390	TRANSP. OPRERATIONS RIG TRANSFORMER(13KV) AND RIG RADIATORS RIG OIL PUMP & PIPING RIG XPANSION TANK+ PIPING RIG LV/HV/NEUT BUSHINGS AND REACTOR RIG BUSHING POTENT DEVICE RIG CIRC SW RIG POTHEADS DISC SW/ OH BUS SW GR & OTHER	1640 1	*HOUR Bach	1640	157653					157653	
+Y50000 +Y7000 +Y20000 +Y55000 +Y9000 +Y10000 +M16000	TRAILER RENTAL, 13 AXLE NYPD ESCORT BARGE RENTAL CRANE SUPPORT (500 TON) WELSBACH ELECTRIC INDEPENDENT ENGRG ANAL :: \$ ALREADY SPENT ON TRANSPORTATION	1 1 1 1 1 1	LS LS LS LS LS LS			·	50000 7000 20000 55000 9000 10000	16000	16000	50000 7000 55000 9000 10000 16000	
		= = = <u>=</u> = =			432265825	**********	**********		***********	************	
	COMPANY GROUP SUBTOTAL			1640	157653		151000	16000	16000	324653	
283(10/14/04)	CL:SSO SUPERVIS & TESTING GROUP FACTORS:			· .	1.23	•					
L580320	1.5 OPERATOR 3 MONTHS 12 HR/DAY, 6DAY 8&TO,CEN.8UBST.NO (CSD-N)	2000	HOUR	2000	130872					130872	
+M17600	ALREADY SPENT ON TESTING	1	LS					17600	17600	17600	
		******	RAXOSES					******			
	COMPANY GROUP SUBTOTAL			2000	130872			17600	17600	148472	

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PRELIMINARY PRINT DATE O	1/30/06			ESTIMAT REPOR	ING SECT T BY GRO	ION UP	CEES.R1 PAGE 24 EST. NO.: 05-4147-AB-03 OLDEST GROUP UPDATE 05/25/04				
CODB	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	BQUI PMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
286(06/09/04)	) CL: B.C.C.		328888	**********				*********			========
+¥30000	MODIFY MIMIC BOARD MISC LABOR, REPROGRAM SOCC PTS.	1					30000			30000	
+L65/65	BCB	100	HOUR	100	6500					6500	
		2612340	238282	432#88##31	**********					0000	*******
	COMPANY GROUP SUBTOTAL			100	6500		3000,0			36500	
300(10/12/05)	M&S: CABLE, CONDUIT * MISC GROUP FACTORS:			. 0.01	0.01	0.01	1.21	1.21			
	CABLE										
UB0265320500 UB0265510500 UB0265220500 UB0265120500 UB0265120500 UB0265120500 UB0264075500 UB0264075500 UB0265820500 UB0265820500 UB0265920500 UB0267120500 UB026720500 UB026720500 UB026720500 UB026720500 UB026720500 UB026720500 UB026720500	CABLE, 7C12,7886/7886C *CABLE,7C12,7886/7886C *CABLE,19C12,7784C *CABLE,600V,12C12,7887C *CABLE,4C12,7885C *CABLE,2C12,7871/7871C *CABLE,600V,1C12,7884C *CABLE,600V,2C16,7811C *CABLE,600V,2C10,7891C *CABLE,4C10,7891C *CABLE,7C10,7894/7894C *CABLE,1C4/0,7893/7893C *CABLE,1C2/0,7893/7893C *CABLE,1C6,7803/7803C OTHER MISC	686 800 10800 5000 9860 1200 4200 1200 1200 600 9860 4800 4000 2400	* LP * LP * LP * LP * LF * LF * LF * LF * LF * LF * LF * LF		5 1 2 1 3 2 1		1324 1936 16074 7563 6741 102 1118 96 886 486 17896 10425 8567 1684			1324 1936 16078 7564 6743 102 1119 96 886 487 17899 10427 8568 1685	
+¥15000 +M35500 +M24228	ADD POTHEADS & ASSOC \$ SPENT ON CABLE & COND. \$ SPENT ON WIRE ROPE	6 1 1	LS LS LS				121000 108900	42955 29316	42955 29316	121000 108900 42955 29316	
	COMPANY GROUP SUBTOTAL				16		304797	72271	72271	377083	

LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRBLIMINARY PRINT DATE 01	1/30/06	ESTIMATING SECTION REPORT BY GROUP						CEES.R1 PAGE 25 EST. NO.: 05-4147-AB-03 OLDEST GROUP UPDATE 05/25/04			
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
				TTTTTTTTTT	========						
510(05/25/04)	ODC: OIL FILL										
+M100000	OIL FILL	1	LOT					100000	100000	100000	100000.00
***********		*****			*******						
	CONTRACT GROUP SUBTOTAL							100000	100000	100000	382232228
540(10/11/05)	ODC:-ENVIR &MISC ITEMS										
+Y10000 +Y10000 +Y1000	GROUNDWATER TESTING AIR TESTING X-RAY SERVICE	1 1 1	LOT LOT LOT				10000 10000 1000			10000 10000	
+¥500 +¥500	CO FACILITIES TRAILER W/TLT,8X21,MONTHS PORTOSAN,MONTHS	13 13	MO MO				6500 6500			6500 6500	
+¥500	RUBBISH REMOVAL SERVICE DEBRIS CONTAINER, 30CY	13	PKUP	•			6500			6500	
+¥5000	GASES/AIR/PROPANE ETC	1	LOT				5000			5000	
+¥20000	GUARD SERVICE	1	LS	· •			20000			20000	
***********	***************************************		******			**********				20000	******
	COMPANY GROUP SUBTOTAL						65500			65500	
548(10/12/05)	ODC:ASBESTOS ABATEMENT										
+10000/85	ALLOW FOR ASBESTOS Abatement	1	LS	71	6000			4000	10000	10000	10000.00
************	*************************************										*======
	CONTRACT GROUP SUBTOTAL			71	6000			4000	10000	10000	

PRELIMINARY PRINT DATE 01	/30/06			ESTIMA REPO	TING SECTI RT BY GROU	ION IP		CEES.R1 PAGE 26 EST. NO.: 05-4147-AB-03 OLDEST GROUP UPDATE 05/25/04				
CODR	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE	
550(10/21/05)	ODC:PERMITS			*******		3440258220	3332884392				······································	
+M25000	PERMITS	1	LS					25000	25000	25000		
	COMPANY GROUP SUBTOTAL						888222222	25000	25000	25000	* - * * * * * * *	
555(10/21/05)	ODC: INDEPENDANT TESTING											
+M50000	INDEPENDANT TESTING	1	LS					50000	50000	50000	50000.00	
	CONTRACT GROUP SUBTOTAL							50000	50000	50000	* = = = = = = = = =	
560(10/21/05)	CC:SURVEYOR/PHOTO/PE.SRVC											
+M100000	SURVEYOR/PHOTO/PE SRVC	1	LS			****		100000	100000	100000	100000.00	
	CONTRACT GROUP SUBTOTAL							100000	100000	100000	121653522	
						• •						

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\*\* END OF BSTIMATE REPORT \*\*

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#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request	
No.:	DPS-14
Requested	Hebert Joseph, (518) 486-2460
By:	December 12, 2005
Date of Request:	
Reply Date:	
Witness:	Conduits
Subject:	

On page E-3-2, the application states that a 3/8 steel plate will be placed upon the top of the conduits for protection, but in figure E-3-1, the diagram states a 1 inch steel plate will be utilized. Which is correct?

### Response to DPS-14:

See Revised Attachment DPS-14, the proposed trench cross section that indicates that 3/8 inch steel plate will be used for the typical trench cross section. One inch thick steel plate will be installed where there is only two feet or less of cover.







Typical Duct Bank Cross Section



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Eric M. Dessen Associate Counsel

#### April 5, 2006

#### VIA DHL OVERNIGHT MAIL

The Honorable Jaclyn A. Brilling Secretary New York State Public Service Commission Three Empire State Plaza Albany, New York 12223

#### Re: Case 05-T-1369: Cedar Street Project Consolidated Edison Company of New York, Inc.

Dear Secretary Brilling:

Consolidated Edison Company of New York, Inc. ("Con Edison") and the Staff of the New York State Department of Public Service ("NYSDPS") have executed the enclosed Joint Proposal resolving all matters related to Con Edison's application to the Commission for a Certificate of Environmental Compatibility and Public Need under Article VII of the Public Service Law for the referenced Cedar Street Project (the "Project"). Enclosed for filing are an original and ten copies of the executed Joint Proposal, with appendices, and the applicable sponsoring affidavits for the Cedar Street application and its subsequent revision. Discussions leading to the signing of the Joint Proposal and to the completion of the Project's proposed Environmental Management and Construction Plan ("EM&CP") were initiated pursuant to 16 NYCRR § 3.9 by letter to you dated January 30, 2006, as supplemented February 6, 2006, including distribution of both draft documents to the Project's service list.

Also enclosed are an original and ten copies of a Joint Statement in Support of the Joint Proposal, executed by Con Edison and NYSDPS Staff. Copies of the executed Joint Proposal with appendices, affidavits, and the Joint Statement in Support are being provided by overnight mail to Judges William Bouteiller and Elizabeth Liebschutz, the presiding officers in this proceeding, and to NYSDPS Staff, as active parties in this proceeding.

Concurrently, Con Edison submits herewith for Commission review and approval three copies of a proposed EM&CP for the Project. Large-scale drawings that support and form a part of the EM&CP are provided on the enclosed CD-ROM. If additional hard copies of these drawings are required, please advise and copies will be promptly forwarded. As noted above, the draft EM&CP was distributed for review to the full Project service list, reflects comments from both NYSDPS and New York State Department of Transportation Staffs, and is consistent with the proposed terms and conditions of the Joint Proposal. Copies of the EM&CP are also being served upon the Commissioners of the Departments of Environmental Conservation and Transportation, and are being placed in branches of the City of Mount Vernon, City of New Rochelle, and Village of Pelham public libraries.

Respectfully submitted,

Eric M. Dessen

Enclosures

C: The Hon. William Bouteiller (w/o EM&CP) The Hon. Elizabeth Liebschutz (w/o EM&CP) Steven Blow, Esq. (NYSDPS) Donna K. Hintz, Esq. (NYSDOT) The Hon. Thomas J. Madison, Jr., Commissioner, NYSDOT (w/EM&CP only) The Hon. Denise M. Sheehan, Commissioner, NYSDEC (w/EM&CP only)



# STATE OF NEW YORK PUBLIC SERVICE COMMISSION

Case 05-T-1369 — Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project

# Joint Proposal

# April 5, 2006

# STATE OF NEW YORK PUBLIC SERVICE COMMISSION

# Case 05-T-1369 — Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project

# Joint Proposal

THIS JOINT PROPOSAL is made as of the 5th day of April 2006 by and among Consolidated Edison Company of New York, Inc. ("Con Edison" or the "Company"), the Staff of the New York State Department of Public Service ("DPS Staff" or "Staff"), (collectively referred to as the "Signatory Parties").

### Introduction

On November 1, 2005 Con Edison filed an application (the "Application") with the New York State Public Service Commission (the "Commission") seeking a certificate of environmental compatibility and public need ("Certificate") pursuant to Article VII of the Public Service Law ("PSL") for the construction and operation of up to two underground 138 kilovolt ("kV") electric transmission feeders along a single transmission line route, approximately three miles long, in southeastern Westchester County, New York ("Westchester County" or the "County"). The Application proposed that the feeders and associated equipment (including two 138 – 13.8 kV transformers at the Cedar Street Substation) would connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with Con Edison's existing Cedar Street Substation located in the City of New Rochelle.<sup>1</sup>

By letter dated February 6, 2006, Con Edison indicated that it had reevaluated its long-term forecast in light of new developments for anticipated area load growth projects and determined that the construction of a second transmission feeder was no longer justified. Con Edison's February 6, 2006 letter provided minor revisions to the Application to reflect this change in Project scope, including revised engineering drawings and revised cost estimates (the "February Revision"). Based on this determination, Con Edison is now seeking a Certificate pursuant to Article VII of the PSL for the construction and operation of a single underground 138 kV electric transmission feeder along the same transmission line route previously proposed. The feeder and associated equipment (including one 138 – 13.8 kV transformer at the Cedar Street Substation) will connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with Con Edison's existing Cedar Street Substation located in the City of New Rochelle (the "Project").

In conjunction with this Joint Proposal, on April 5, 2006, Con Edison filed with the Commission a proposed Environmental Management and Construction Plan ("EM&CP") for the Project. Copies of the EM&CP were also served upon all statutory parties and all other service list parties on the same date. In addition, Con Edison has coordinated with Region 3 of the New York State Department of Environmental Conservation ("NYSDEC") regarding the existing Cedar Street Substation State Pollutant Discharge Elimination System ("SPDES")

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<sup>&</sup>lt;sup>1</sup> On November 21, 2005, the Secretary to the Commission advised Con Edison, pursuant to PSL §123(1), that its application complied with PSL §122 as of its filing date.

permit and has been informed that the addition of a third transformer at the Cedar Street Substation will not require a modification to the existing permit. Further, NYSDEC Region 3 has indicated that the existing SPDES permit for the Cedar Street Substation would be updated to reflect the addition of a third transformer when the permit is scheduled for renewal in 2008.

A public statement hearing was held before Presiding Administrative Law Judge Elizabeth Leibschutz in New Rochelle, New York, on the afternoon of January 19, 2006, the purpose of which was to receive unsworn statements from members of the public regarding the Application and other supporting materials. One statement from a local resident was received during the hearing, inquiring whether the Project would be funded by Con Edison customers or shareholders and commenting that there should be better coordination between the various utilities and governmental agencies to avoid unnecessary street excavations. At the public statement hearing, Con Edison advised the Presiding Officer that it believed it had substantially resolved among the interested parties all issues associated with construction and operation of the Project, and contemplated development and execution of a Joint Proposal in settlement of the case, to be submitted to her for certification directly to the Commission.

An opportunity for discovery has existed between the filing of the Application on November 1, 2005 and the date hereof. After exploratory discussions among the parties, a letter noticing the scheduling of negotiations was sent to all statutory parties and other interested persons on January 30, 2006, and was duly submitted to the Secretary of the Commission by letter of the same date.<sup>2</sup>

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<sup>&</sup>lt;sup>2</sup> A negotiating session, attended by Con Edison and DPS Staff, was held on February 15, 2006 at Con Edison's office in Rye, New York.

On December 23, 2005, Con Edison responded to interrogatories submitted by DPS Staff with respect to the Project's interaction with the Con Edison electric system, and further details of anticipated transmission line construction and electric and magnetic field ("EMF") impacts. On February 6, 2006, Con Edison submitted to Staff revised responses to certain of the interrogatories in light of the Company's revisions to the Project. Con Edison's responses, as revised, satisfied Staff and no further interrogatories have been received from Staff or any other party.

A joint resolution of the case is now feasible because, after thorough investigation and discussion, the Signatory Parties more fully understand their respective positions and recognize that a mutually satisfactory resolution of those positions is possible. The Signatory Parties also believe that this Joint Proposal will further the objective of allowing Con Edison to meet both near-term and projected long-term electric load growth in southeastern Westchester County in an environmentally sound manner.

# **Terms of Joint Proposal**

### I. General Provisions

1. It is understood that each provision of this Joint Proposal is in consideration and support of all of the other provisions of this Joint Proposal and is expressly conditioned upon approval of the terms of this Joint Proposal in full by the Commission. If the Commission fails to adopt the terms of this Joint Proposal, the parties to the Joint Proposal shall be free to pursue their respective positions in this proceeding without prejudice.

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2. The terms and provisions of this Joint Proposal apply solely to, and are binding only in, the context of the present Application. None of the terms or provisions of this Joint Proposal and none of the positions taken herein by any party may be referred to, cited or relied upon in any fashion as precedent or otherwise in any other proceeding before this Commission or any other regulatory agency or before any court of law for any purpose, except in furtherance of ensuring the effectuation of the purposes and results of this Joint Proposal.

3. The Signatory Parties agree to submit this Joint Proposal to the Commission along with a request that the Commission expeditiously adopt the terms and provisions of this Joint Proposal as set forth herein.

4. The Signatory Parties recognize that certain provisions of this Joint Proposal contemplate actions to be taken in the future to effectuate fully this Joint Proposal. Accordingly, the Signatory Parties agree to cooperate with each other in good faith in taking such actions.

5. In the event of any disagreement over the interpretation of this Joint Proposal or implementation of any of the provisions of this Joint Proposal, which cannot be resolved informally among the Signatory Parties, such disagreement shall be resolved in the following manner: (a) the Signatory Parties shall promptly convene a conference and in good faith attempt to resolve any such disagreement; and (b) if any such disagreement cannot be resolved by the Signatory Parties, any Signatory Party may petition the Commission for resolution of the disputed matter.

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6. This Joint Proposal shall not constitute a waiver by Con Edison of any rights it might have to apply for additional or modified permits, approvals or certificates from the Commission, NYSDEC, or any other agency in accordance with relevant provisions of law.

7. This Joint Proposal is being executed in counterpart originals, and shall be binding on each Signatory Party when the counterparts have been executed.

8. The Applicant has provided the necessary affidavits that will permit the pre-filed testimony, exhibits and appendices comprising the Application and the supplemental exhibits agreed upon by the Signatory Parties to this Joint Proposal to be admitted as record evidence in this proceeding.

## II. Evidentiary Record

The evidentiary record in this proceeding consists of the Application, testimony and exhibits of Con Edison (filed November 1, 2005 and revised by letter dated February 6, 2006), as well as Con Edison's responses to DPS Staff's interrogatories (submitted under cover letter dated December 23, 2005, as supplemented on February 6, 2006).

# **III.** Description of Project and its Location

1. The following information is required by 16 NYCRR § 85-2.8 and is detailed in Exhibit 2 of the Application, as revised: The Project will consist of a single transmission line containing one electrical feeder to be installed entirely underground and within existing Con Edison property, public roadway rights-of-way ("ROW") and easements as may be required from the New York State Thruway Authority ("NYSTA"). The feeder, totaling approximately three

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miles in length and operating at 138 kV, would consist of a three-phase, single copper conductor solid dielectric insulated cable circuit. Each feeder cable will be installed in a fiberglass reinforced epoxy ("FRE") conduit. The conduits will be arranged in a duct bank with four conduits (one for each phase, plus one spare) in a square configuration, buried approximately three feet below grade. A steel plate will be placed over the duct banks to provide additional protection from external loads and unauthorized excavations. The line would connect Con Edison's Washington Street Substation in Mount Vernon with its Cedar Street Substation in New Rochelle. Equipment required to accommodate the new feeder will be added at both the Washington Street and Cedar Street Substations, including installation of a 138/13.8 kV transformer at the Cedar Street Substation. [Application, Exh. 2; February Revision].

2. The following information is required by 16 NYCRR § 86.3 and is detailed in Exhibit 2 of the Application: The proposed route for the transmission line begins at Con Edison's Washington Street Substation and heads east along Hartford Avenue for a distance of approximately 1,300 feet to the intersection with South Columbus Avenue. The route continues north along South Columbus Avenue, for approximately 100 feet to the intersection with Beechwood Avenue. At Beechwood Avenue, the route turns east and continues for a distance of approximately 1,300 feet to the intersection of Bradford Road. At Bradford Road the route travels northeast for approximately 200 feet and passes underneath the New Haven Line of the Metro-North Railroad and enters Wilson Woods Park. The route continues northeast through the park along Wilson Woods Park Road for approximately 2,200 feet. Before the intersection of Lincoln Avenue, the route turns east, crossing the Hutchinson River Parkway and Hutchinson River via horizontal boring to a location approximately 160 feet south of the intersection of Lincoln Avenue and First Avenue. The route then continues north along First Avenue then east

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along Lincoln Avenue for approximately 7,600 feet to the intersection with North Avenue. East of North Avenue, Lincoln Avenue becomes Manor Place. The route continues northeast through the North Avenue intersection onto Manor Place for approximately 500 feet to The Circle. The route travels south for approximately 350 feet along The Circle then intersects Manhattan Avenue. On Manhattan Avenue, the route turns northeast for approximately 575 feet and veers south onto vacant NYSTA property, adjacent to a the southbound exit lane of Interchange 16 of the New England Thruway (I-95). The route continues southeast for approximately 1,300 feet, crossing both southbound exit and entrance lanes of the Thruway and passes under the 8-lane New England Thruway overpass and under Metro-North's New Haven Line (which is also used by Amtrak between New Rochelle and New Haven) to the intersection of Commerce Street and Cedar Street, at which point the route turns south and continues along Commerce Street for approximately 125 feet to the gated driveway leading into the walled Cedar Street Substation. [Application, Exb. 2].

3. Maps showing the proposed route of the transmission line and the overall location of the Project, as required by 16 NYCRR § 86.3, are incorporated into this Joint Proposal by reference to Figures 2-1, 2-2, and 2-3a-d of Application Exhibit 2.

# IV. Environmental Compatibility and Public Need

The Commission must consider the totality of all of the relevant factors in making its determination of environmental compatibility and public need. The relevant factors include, without limitation, electric system requirements, cost, environmental impacts (including EMF and noise impacts), the availability and impact of alternatives, undergrounding considerations,

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conformance to long-range plans, system reliability impact studies, local laws, real property considerations, communications, and the public interest, convenience and necessity.

#### A. Electric System Requirements

The following information is required by 16 NYCRR § 88.4 and is detailed in Exhibit E-4 of the Application, as revised:

The Cedar Street Substation, located in the City of New Rochelle, currently 1. supplies the electrical needs of southeastern Westchester County, from Mamaroneck on the north to Pelham on the south, and from the Long Island Sound on the east to the City of New Rochelle on the west. The Cedar Street Substation has two transformers supplied from two 138 kV feeders emanating from Con Edison's Dunwoodie North Switching Station in Yonkers. As part of its ongoing electrical load planning efforts, Con Edison periodically re-evaluates its existing transmission network and substation facility infrastructure, as well as its electric load forecasts. The ten-year load forecast reflects projected substation peak loadings, taking into account load increases from new and imminent projects that will contribute to the anticipated electrical load growth in each region served by an area substation. The area substations and associated supply feeders must be capable of supplying the projected peak loads during a first contingency condition. A first contingency condition is defined as the loss of an area transformer and/or its associated 138 kV feeder. Area substation capabilities are determined based on this emergency condition, i.e., one facility being out of service. Con Edison's most recent ten-year load forecast, updated on September 2, 2005, projects a six-megawatt overload, during first contingency conditions, on the Cedar Street Substation as early as summer 2007. This projected overload condition at Cedar Street, if left uncorrected, would threaten network reliability in southeastern Westchester County and the reliability of service to Con Edison's customers served from this

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substation. This load forecast and the substation loadings and capabilities are presented in Table E-4.1 of the Application. [Application, Exh. E-4; Pre-filed Direct Testimony of James Shannon and Jairo Gomez].

2. The projected load forecasts reflect several significant construction projects currently underway or planned for the southeastern portion of the Westchester County in 2006 and beyond, including two new buildings under construction at the Iona College campus in the City of New Rochelle, a proposed new high school, also in the City of New Rochelle, and various planned major residential, commercial, and infrastructure developments in New Rochelle and elsewhere in southeastern Westchester County. These anticipated projects would contribute substantially to the increase in electric load in this area. [Application, Exh. E-4; Pre-filed Direct Testimony of James Shannon and Jairo Gomez].

3. Installation of a third transformer at the Cedar Street Substation, as well as the proposed 138 kV underground transmission line supply feeder, will allow Con Edison to meet expected near-term electrical load growth in southeastern Westchester County. The Project will also improve reliability on the Con Edison electric transmission and distribution system and provide additional capacity to support expected long-term load growth in southeastern Westchester County. First contingency overload conditions, as reflected in Con Edison's most recent ten-year load forecast for the Cedar Street Substation, will be relieved through construction of the Project. [Application, Exh. E-4; Pre-filed Direct Testimony of James Shannon and Jairo Gomez].

4. Con Edison seeks to complete construction of the Project by May 2007 to meet both near-term and anticipated long-term electric load growth in the County. [Application, Exh. E-4].

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#### B. Cost

The following information is required by 16 NYCRR § 86.10 and is detailed in Exhibit 9 of the Application, as revised: The capital cost of construction of the Project is estimated to be \$44,166,137. The cost estimate covers installation of the approximately three-mile transmission line and improvements at the existing Washington Street and Cedar Street Substations, including installation of a third transformer and associated equipment at the Cedar Street Substation. The Washington Street installation will include the addition of circuit switchers, cable terminations, potheads, relays, and other miscellaneous control wiring, conduit, and cable. [Application, Exh. 9; Pre-filed Direct Testimony of Arnold Wong and Joseph Liberatori; February Revision].

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#### C. Environmental Impacts

The following information is required by 16 NYCRR § 86.5 and is detailed in Exhibit 4 of the Application, as revised:

1. <u>General</u> - The Application and supplemental materials supplied for the record by Con Edison describe the nature of the probable environmental impacts of the Project and are briefly summarized below. The environmental impacts of the Project are expected to be minimal and limited to temporary construction disturbance. Since the transmission line will be underground, the transmission line ROW will not be noticeable following the temporary impacts associated with construction activities. Exhibit 4 of the Application, as modified by the February Revision, addresses all expected environmental effects.

2. <u>Land Uses</u> - Land uses adjacent to or near the proposed transmission line consist of manufacturing and industrial uses; public parklands; transportation corridors; low-, medium-, and high-density residential uses; institutional uses; mixed-use (non-residential) development; and commercial/retail uses. Parks and recreational uses adjacent to the proposed transmission line include Wilson Woods Park and the associated pool and recreation center in Mount Vernon and Lincoln Park and the Great Lawn in New Rochelle. There are no agricultural land uses adjacent to the proposed route or connecting substations. The proposed transmission line will be installed primarily within the curb-to-curb portion of the ROW of public roadways, thereby minimizing potential long-term land use impacts. Potential impacts on adjacent land uses during construction will be mitigated by minimizing work crew time on site, implementing equipment noise reduction, prompt restoration of the construction zone, and implementation of traffic control measures. [Application, Exh. 4, Section 4.2].

3. <u>Aesthetics and Visual Resources</u> - Noted visual or aesthetic resources located in the vicinity of the proposed transmission route include the Wilson Woods Park in Mount Vernon, Lincoln Park on Lincoln Avenue in New Rochelle, and the Great Lawn in New Rochelle. Since the transmission line will be underground, the transmission line ROW will not be noticeable following the temporary visual impacts associated with construction activities. Accordingly, there will be no long-term, adverse visual impacts attributable to the proposed transmission line. Equipment additions at the Washington Street and Cedar Street Substations will also not result in any impact to visual and aesthetic resources. The interconnection of the new 138 kV transmission line at the Washington Street Substation and the installation of the new transformer at the Cedar Street Substation will not create any new visual elements at these locations. From public vantage points near the Lyons Place and Hartford Avenue intersection, the Washington Street Substation will be viewed in the context of a mixed industrial setting. The Cedar Street Substation is located inside a 15-foot high masonry wall, and the facility presents an uncluttered and unidentified public facade. [Application, Exh. 4, Section 4.3].

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Cultural Resources - No properties listed in the State or National Register of 4. Historic Places will be impacted by the construction or operation of the Project. One National Register Listed ("NRL") property, Rochelle Park - Rochelle Heights Historic District, is located within the Project area; a second NRL property, the Pelham Firehouse, is located adjacent to or within one block of the transmission line route. Con Edison has consulted with the Office of Parks, Recreation and Historic Preservation ("OPRHP"), which by letter dated February 22, 2006, stated that, based upon its review of the Phase IA Cultural Resources Report submitted as part of the Application, alluvial soils should be identified and marked on Project plans so that the potential for buried deposits can be assessed and a Phase IB testing strategy can be developed. The proposed transmission line will be installed primarily within the curb-to-curb portion of the ROW of public roadways. Prior disturbance along these ROW essentially eliminates the potential for encountering significant archaeological sites along these routes. To provide for the protection of any unknown archeological resources, an Unanticipated Discovery Plan has been prepared and will be implemented during construction. [Application, Exh. 4, Section 4.4; Appendix D].

5. <u>Terrestrial Ecology and Wetlands</u> - The area traversed by the route for the proposed transmission line does not contain any unusual or unique ecological communities. No wetlands or streams will be impacted by the proposed excavation and construction of the transmission lines. No federally or New York State listed or proposed endangered or threatened species are known to exist in the Project area. The proposed transmission line will be installed within existing paved roadways for nearly its entire length from the Washington Street Substation to the Cedar Street Substation. Accordingly, the vegetative communities within the transmission line corridor consist almost entirely of roadside areas and previously developed

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areas that may or may not be directly affected by the transmission line. The upgrade and installation work at the Washington Street and Cedar Street Substations will take place within the confines of existing substations and will not disturb any natural habitats. Accordingly, impacts on terrestrial and wildlife resources from construction of the Project will be minor and temporary. [Application, Exh. 4, Section 4.5].

6. <u>Topography and Soils</u> - None of the soil or geologic conditions encountered along the proposed transmission line route present any engineering or construction issues that cannot be easily addressed through conventional construction methods. The proposed transmission line will be placed primarily in existing roadway ROW, where soil types and topography are ideally suited to the common construction methods to be employed. When completed, the portion of the corridor excavated for the transmission line will be returned to its original topographic and drainage conditions. A state-licensed contractor will dispose of excavated soils and asphalt at an appropriately licensed facility. [Application, Exh. 4, Section 4.6].

7. <u>Water Resources</u> - The surface water bodies within one-mile of the Washington Street Substation, Cedar Street Substation and the transmission line route include the Hutchinson River/Pelham Lake, Glenwood Lake, Huguenot Lake, Beechmont Lake, and Echo Bay (Long Island Sound) (See Application Figure 2-1). The Hutchinson River is the only water body that will be crossed by the proposed transmission line. The crossing will be accomplished via horizontal boring, therefore, the riverbed and banks will not be disturbed. Similarly, no impacts to the flood plain or other upstream or downstream properties are expected because the construction of the transmission lines will not change the existing grades within the flood plain. Construction activities at the Washington Street and Cedar Street Substations will not impact any surface water bodies or flood plains. Construction of the transmission line will require minimal

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water supply. If water is required for construction activities, such as for dust control, pavement cutting, etc., water will be brought to the construction site in a tanker truck. No water supply will be required for the transmission line during operation. The Cedar Street Substation is an unmanned facility and water demand will not significantly change with the addition of the proposed transformer. During final engineering and design for the Project, Con Edison will verify that existing water supply and pressure is adequate to provide fire protection for the third transformer. Groundwater resources throughout the Project area are classified by the NYSDEC as GA, fresh groundwater that is suitable for use with or without treatment; however, municipal water supply systems that serve the Project area do not rely on local wells for water supply. [Application, Exh. 4, Section 4.7]. A search of the NYSDEC water well information records for Westchester County indicate no public water supply wells are located within the Project area. [http://www.dec.state.ny.us/cfmx/extapps/WaterWell/index.cfm].

8. <u>Traffic and Transportation</u> - The proposed route will be located primarily within the curb-to curb portion of the ROW of public roadways. Construction activities will require the construction of a manhole and duct system installed in an open cut trench followed by installation of the feeder cable. The initial trench will be temporarily restored and allowed to settle for several months before final paving restoration. In the interim, cable installation will consist of cable pulling and splicing operations. The cable pulling will require equipment operation for several hours, typically a day to a day-and-a-half, at each manhole location.
Pulling operations are normally daytime operations but can be scheduled for night time, if traffic conditions warrant. Splicing will follow the cable pulling, at which time round-the-clock operations will be required to splice the cables. Splice trailers, or possibly splice tents, will be set up for approximately one week at each manhole location. The construction of the feeder will

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be closely coordinated with the local Departments of Public Works or other appropriate agency responsible for roadway maintenance and traffic to ensure the minimum impact to the community. In particular, paving projects have already been rescheduled after duct bank installation. The duct bank will be installed along the transmission line route within the curb-tocurb portion of street ROW, with the exception of the line's crossing the Hutchinson River/Hutchinson River Parkway and the New England Thruway. Crossing of the Hutchinson River Parkway and the Hutchinson River will be conducted via horizontal boring in a manner acceptable to the New York State Department of Transportation ("NYSDOT"). Accordingly, traffic along the Hutchinson River Parkway will not be affected. Crossing of the New England Thruway will be conducted via an existing entrance ramp underpass at Interchange 16. The proposed route also crosses a southbound exit ramp. Con Edison will substantively comply with the requirements set forth in any NYSDOT Highway Crossing and Utility Work Permits and/or NYSTA occupancy and work permits required for the Project, consistent with the Commission's ongoing jurisdiction under PSL Article VII. Con Edison will also comply with all applicable New York State traffic control standards to provide for the maintenance and protection of traffic along the Hutchinson River Parkway and New England Thruway. Con Edison will coordinate with NYSDOT, NYSTA and Westchester County, as applicable, to finalize proposed highway crossing locations and techniques and to develop and implement a Maintenance and Protection of Traffic Plan to ensure safe and adequate traffic operations along the Hutchinson River Parkway and the New England Thruway. Traffic control on local roadways, including Lincoln Avenue, will be established in accordance with Con Edison's Work Area Protection and Traffic Control Field Manual, which addresses all municipal requirements within Con Edison's service

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territory. The proposed Washington and Cedar Street Substation improvements will not impact existing traffic conditions. [Application, Exh. 4, Section 4.8].

9. Noise - Construction noise-related impacts from the proposed 138 kV transmission line and proposed improvements at the Washington and Cedar Street Substations will be minimal. Construction noise at the Washington Street Substation will be limited in terms of intensity and duration and will have no appreciable affect on the surrounding industrial neighborhood. Construction noise-related impacts from the addition of a third transformer at the Cedar Street Substation are expected to be minimal, as construction will be mitigated by the surrounding 15-foot high masonry wall. Additionally, construction noise along the transmission line route, while varying according to the equipment in use, will be mitigated by the attenuating effect of distance; the intermittent and short lived character of the noise; and the use of functional mufflers on all construction equipment. The estimated noise levels during construction are expected to generally be in compliance with all local noise standards; nevertheless, waivers from the local noise ordinances are required to enable Con Edison to extend construction activities beyond the hours prescribed to ensure the in-service date is met. Operational noise-related impacts from the proposed 138 kV transmission line and proposed improvements at the Washington and Cedar Street Substations are also expected to be minimal. No additional noise generating equipment will be installed at the Washington Street Substation, so operational noise levels will remain unchanged. During operation, the underground feeder will not generate noise. The nearest residences to the Cedar Street Substation are approximately 800 feet distant and the new transformer will be placed within a masonry block firewall within the walled confines of the Substation. Consequently, no impacts on ambient noise quality are anticipated from the operations of the Cedar Street Substation. Operational noise levels, at the location of the nearest

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residential receptors, are expected to comply with the specified City of New Rochelle standards. [Application, Exh. 4, Sections 4.9].

Electric and Magnetic Fields - Con Edison has conducted an analysis of the 10. electric and magnetic fields expected to be produced by the Project. The feeder cables will not produce an electric field external to the concentric cable shield and metallic sheath. With both multi-point bonded and single-point bonded configurations, the shield and sheath are grounded at a minimum of one location along each section. Therefore, no electric field from the energized phase conductor can exit outside of the grounded shield and sheath. Con Edison's worst-case calculations of the magnetic field levels for the transmission line demonstrate that the maximum magnetic field level produced by the proposed underground cable circuits at one meter above ground at 50 feet from the centerline of the cable circuits at all locations along the proposed cable route is no greater than approximately 3 milliGauss ("mG") throughout the proposed route, well below the Commission's maximum 200 mG magnetic field interim standard. The analysis also shows that magnetic field levels at the boundary of the Cedar Street Substation, with one new transformer, will not exceed 120 mG. Therefore, the Project complies with the electromagnetic field standards established by the Commission in Opinion 78-13 (issued June 19, 1978) and the Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities (issued September 11, 1990). [Application, Exh. 4, Sections 4.10; Response to Interrogatory/Document Request DPS-7, dated December 19, 2005; February Revision].

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## D. The Availability and Impact of Alternatives

The following information is required by 16 NYCRR § 86.4 and is detailed in Exhibit 3 of the Application:

1. Exhibit 3 of the Application evaluates the reasonable alternatives for the proposed transmission line. The Application demonstrates that the selected route for the proposed transmission line is preferred. With respect to the transmission line, the proposed route is preferred because it makes extensive use of existing ROW, avoids the disturbance of natural habitat and the need for significant clearing of vegetation, and does not require the acquisition of new ROW or easements from private property owners. [Application, Exh. 3; Pre-filed Direct Testimony of Arnold Wong and Joseph Liberatori].

2. Neither demand side management ("DSM") nor distributed generation ("DG") are considered viable long-term alternatives to the Project. DSM does not adequately address the significant new construction in southeastern Westchester County, either currently underway or planned in 2006 and beyond, which will substantially increase the area's electric load. With respect to DG, construction of the large number of required DG projects necessary to support area electric demand through 2015 is not considered probable and could present environmental concerns related to technologies and fuel sources used. The Project is intended as a long-term solution and is in the public interest because it will allow Con Edison to meet its obligations under the PSL to supply reliable and essential electric service to residential, commercial, and municipal customers in the southeastern Westchester County. [Application, Exhs. 3, E-4; Pre-filed Direct Testimony of Arnold Wong and Joseph Liberatori].

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## E. Undergrounding Considerations

The following information is required by 16 NYCRR § 88.3 and is detailed in Exhibit E-3 of the Application, as revised: The transmission line is designed for underground installation.

## F. Conformance to Long-Range Plans

The following information is required by PSL § 126.1(d) and 16 NYCRR § 88.4 and is detailed in Exhibit E-4 of the Application: The Project does not violate any long-range plans and is consistent with the most recent State Energy Plan ("SEP") (2002) by providing load distribution relief that will help maintain the reliability of the existing electrical system transmission and distribution infrastructure. Specifically, the Project supports the strategies for achieving the goals identified in the SEP, including "investments in natural gas and electricity transmission and distribution system infrastructures, including consideration of multiple redundancies, shared design practices, shared inventories, and flexibility necessary to ensure continued safe and reliable system operation." The Project has been identified in the Con Edison 2006-2015 Area Substation and Subtransmission Feeder Ten-Year Load Relief Program. [Application, Exh. E-4.2].

### G. System Reliability Impact Studies

The following information is required by 16 NYCRR § 88.4. For the reasons set forth in Con Edison's Motion for Waivers of Application Requirements, dated October 31, 2005, system reliability impact studies for the Project are unnecessary. The proposed third transformer at the Cedar Street Substation will only be supplied from one of the existing 138 kV radial feeders, which runs from Con Edison's Dunwoodie North 138 kV Substation to the Washington Street Substation. Loading on the feeder, which will supply the third transformer at Cedar Street will

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depend entirely on the load served by the Cedar Street Substation. Given the radial supply of the proposed third transformer, power will always flow unidirectionally from the Dunwoodie North Substation to the Cedar Street Substation. Consequently, with no other source of flow, there are no system impacts, and feeder and substation transformer flows can be easily calculated from the load supplied by the Cedar Street Substation. The Project will have no overall effect on system loads. [Con Edison's Motion for Waivers of Application Requirements, dated October 31, 2005].

#### H. Local Laws

The following information is required by PSL §126(1)(f) and 16 NYCRR § 86.8 and is detailed in Exhibit 7 of the Application: The Project will comply with the substantive requirements of the applicable sections of the Westchester County, Mount Vernon, Pelham, and New Rochelle Codes, with the exception of the specified sections of these codes as set forth in Appendix A to this Joint Proposal ("Appendix A"). The Commission should refuse to apply such specified sections of the Westchester County, Mount Vernon, Pelham, and New Rochelle Codes because they are unreasonably restrictive for the reasons set forth in Exhibit 7 of the Application and Appendix A. [Application, Exh. 7].

### **1.** Real Property Considerations

The following information is required by 16 NYCRR § 86.9 and is detailed in Exhibit 8 of the Application: Within a reasonable time after Commission Article VII certification of the Project, Con Edison will obtain any necessary easements or revocable consents for use of property rights from NYSTA and Westchester County to allow construction along that portion of

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the transmission line controlled or owned by NYSTA or Westchester County. [Application, Exh. 8].

## J. Communications

The following information is required by 16 NYCRR § 88.5 and is detailed in Exhibit E-5 of the Application: The Application evaluates the effect of the Project on telecommunications and radio and television signal transmissions. The Application demonstrates that there are no significant effects on communications. [Application, Exh. E-5].

## K. Public Interest, Convenience and Necessity

The following information is required by PSL  $\frac{126(1)(g)}{126(1)(g)}$  and is detailed in Exhibit E-4 of the Application:

1. The proposed new transformer at the Cedar Street Substation and the 138 kV underground transmission feeder will serve the public in several ways, including:

a. Providing increased capability to the Cedar Street Substation in southeastern Westchester County to meet expected electrical growth and to avoid the potential for an overload situation;

b. Assuring the continued availability and reliability of electric service in the southeastern Westchester County region through the construction of a new transmission feeder between the Washington Street and Cedar Street Substations;

c. Allowing Con Edison to meet its first Contingency Design Criteria for southeastern Westchester County;

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d. Minimizing visual impacts by using underground cables;

e. Minimizing potential environmental impacts by using solid dielectric environmental cables rather than oil-filled electrical cables; and

f. Minimizing potential environmental impacts through the installation of the new 138 kV transmission feeder almost exclusively within existing roadways.

2. This Project is essential to the region's electric transmission and distribution system. Construction of the Project would result in minimal environmental impacts to residential and commercial operations in the area. Additionally, potential overload conditions, which would occur as early as 2007, will be avoided and Con Edison will have an enhanced ability to meet the growing electrical demands of its residential, commercial, industrial and institutional customers in Westchester County. [Application, Exh. E-4].

#### V. Proposed Findings

The Signatory Parties agree that the record in this proceeding supports the following findings:

1. The Project is necessary to meet near- and anticipated long-term electric growth in southeastern Westchester County and to improve electric system reliability.

2. Construction of the Project's transmission line along the preferred route proposed in Con Edison's Application is consistent with the most recent New York State Energy Plan, which sets forth the State's energy policies and long-range planning objectives and strategies. 3. The nature of the probable environmental impacts will be temporary in that they will be associated primarily with the construction activities necessary to dig the trenches and lay the cables. No waters of the State or wetlands will be impacted by the Project. No significant impacts are expected with regard to the physical or chemical properties of existing soils during Project construction or operation. No release of fluids is possible as a result of potential damage to the solid dielectric cable to be used for the Project. No significant visual impacts will result from any of the structures or equipment associated with the proposed transmission facility. All of the construction methods for the Project are contained in the EM&CP and are designed to minimize impacts on the physical environment.

4. The Project, as proposed, represents the minimum adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives, and other considerations such as the effects on agricultural lands, wetlands, parklands and river corridors, because the trenching operation for laying the cable is expected to produce only localized and temporary effects and the Project is otherwise confined almost exclusively to existing roadway and electric transmission line ROW.

5. The Project will be located underground.

6. The Project's component facilities conform to applicable state and local laws and regulations because the cable and additional transformer at the Cedar Street Substation meet EMF guidelines, have no effect on communications and, with respect to the transmission line, will be buried and connected to the Washington Street and Cedar Street Substations in conformance with all applicable industry codes and Con Edison's safety and construction requirements. The Project will comply with the substantive requirements of the applicable County, Mount Vernon, Pelham and New Rochelle Codes identified in Exhibit 7 of the

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Application, except for those sections of these codes delineated in Exhibit 7 and Appendix A, for which reasonable justifications that those sections are unreasonably restrictive in view of the factors set forth in PSL §126(1)(f) have been proffered by Con Edison.

7. The Project will serve the public interest, convenience and necessity because it will, with minimum environmental impact, add needed transmission and substation capability in southeastern Westchester and improve electric system reliability. The costs of the Project appear reasonable for the purposes of Article VII review.

8. Con Edison's motion dated October 31, 2005, seeking to modify or waive six specific regulatory requirements for information to be included in the application, provides reasonable justification for the modifications or waivers requested. A summary of Con Edison's request for modification or waiver of specific regulatory requirements is set forth in Appendix B to this Joint Proposal ("Appendix B").

9. A Certificate of Environmental Compatibility and Public Need should be granted and an Environmental Management and Construction Plan should be approved, subject to the terms and conditions contained in the Ordering Clauses below.

#### VI. Ordering Clauses

The Signatory Parties agree that the following Ordering Clauses are appropriate for the Project:

## General Conditions

1. Subject to the conditions set forth in this Opinion and Order, Consolidated Edison Company of New York, Inc. ("Con Edison" or the "Company") is granted a Certificate of Environmental Compatibility and Public Need authorizing it to construct and operate an

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underground 138 kV electric transmission line, consisting of one electrical feeder and associated equipment, including one new 138-13.8 kV transformer at an area substation, as detailed in the Application as revised and as described herein (the "Project").

2. Con Edison's motion dated October 31, 2005, for modifications and waivers of specified application information requirements, as set forth in Appendix A hereto, is granted.

3. Con Edison's request that the Public Service Commission ("Commission") refuse to apply specified provisions of the Westchester County Code, City of Mount Vernon Code, Village of Pelham Code, and City of New Rochelle Code as set forth in Exhibit 7 of the Application and Appendix A, is granted.

4. Construction of the Project shall not commence in the affected area(s) until Con Edison has received such property transfers, easements, consents, or permits from the New York State Thruway Authority ("NYSTA"), NYSDOT, or Westchester County as are necessary to permit construction to commence in the affected area(s).

5. The Commission hereby approves the Environmental Management and Construction Plan ("EM&CP") filed by Con Edison on April 5, 2006.

6. Except where this Opinion and Order requires otherwise, the terms of the Joint Proposal submitted in the proceeding and the environmental protection measures contained in the Application (and in the related statements made by Con Edison) have been incorporated into the EM&CP and shall be adhered to during construction, operation and maintenance of the authorized Project. Applicable provisions of the Project's EM&CP and Orders approving the EM&CP shall be incorporated into contracts associated with the Project.

7. Con Edison shall, within 30 days after the issuance of this Opinion and Order, submit to the Commission either a petition for rehearing or a verified statement that it accepts

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and will comply with the Certificate requirements. Failure to comply with this Ordering Clause shall invalidate the Certificate for the Project.

8. (a) Each substantive state and local law and regulation applicable to the Project authorized by this Opinion and Order shall apply, except the substantive local laws or regulations which the Commission has refused to apply as being unreasonably restrictive.

(b) No state or local laws or regulations purporting to require any approval, consent, permit, certificate or other condition for the construction or operation of the Project authorized by this Opinion and Order shall apply, except (i) those of the Public Service Law and regulations and orders adopted thereunder, (ii) those provided by otherwise applicable State law for the protection of employees engaged in the construction and operation of the Project, and (iii) those permits issued under a federally-delegated environmental permitting program. Con Edison will submit forms and substantively comply with all applicable State and local regulations for occupancy, construction, and use of rights-of-way. The Company may petition the Commission to seek resolution of any dispute that may arise in connection with its substantive compliance with such permits and approvals.

(c) Nothing in this Opinion and Order precludes Con Edison from voluntarily subjecting itself to any such state or local approval, consent, permit, certificate, or other condition.

(d) The specified sections of the Westchester County, Mount Vernon, Pelham, and New Rochelle Codes for which Con Edison has sought waivers, as delineated in Exhibit 7 of the Application and Appendix A to this Joint Proposal, shall not apply.

(e) Con Edison shall undergo highway work permit and use and occupancy permit review and obtain a highway work permit and use and occupancy permit from NYSDOT

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pursuant to 17 NYCRR Part 131 for the construction and operation of the Project, subject to the Commission's ongoing jurisdiction. Con Edison shall coordinate with the NYSDOT for all work to be performed in the right-of-way of State highways, subject to the Commission's ongoing jurisdiction. Prior to submitting its construction plans for the Project, Con Edison will provide to NYSDOT a preliminary design marked to avoid conflicts with potential future transportation projects that NYSDOT may seek to undertake in the future and shall offer to consult with NYSDOT concerning any comments it may offer and will use reasonable efforts to accommodate any NYSDOT concerns. All work within State highway rights-of-way shall be designed and performed according to the traffic and safety standards and other substantive requirements contained in 17 NYCRR Part 131, entitled Accommodation of Utilities Within State Highway Right-of-Way, applicable design standards of the American Association of State Highway and Transportation Officials (AASHTO), the Manual of Uniform Traffic Control Devices (MUTCD), the Highway Design Manual, the Policy and Standards for Entrances to State Highways, the Requirements for the Design and Construction of Underground Utility Installations Within the State Highway ROW, the Accommodation Plan, and the NYSDOT 2002 Standard Specifications.

9. Con Edison shall construct the facilities in accordance with those portions of DPS Staff's *Revised Interim Standards and Practices for Environmental Management and Construction of Gas Transmission Facilities in New York State (Standards and Practices),* effective February 21, 2003 (adopted in Case 02-T-1162), that are applicable to this Project and not specifically prescribed in the EM&CP, particularly with regards to archaeological resources, construction practices and techniques, water bodies and wetlands, erosion control, right-of-way ("ROW") clearing and maintenance, and ROW restoration, except as otherwise specified herein.

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10. Con Edison shall report any proposed changes in the approved EM&CP to DPS Staff, NYSDOT, and the New York State Department of Environmental Conservation ("NYSDEC"). DPS Staff will refer to the Secretary of the Commission (or a designee) reports of any proposed changes that do not cause substantial change in the Project's environmental impact. DPS Staff will refer all other proposed changes in the EM&CP to the Commission for approval. Upon being advised that DPS Staff will refer a proposed change to the Commission, Con Edison shall notify all affected statutory and active parties, and all property owners or lessees whose property is affected by the proposed change. The notice shall describe the original conditions and requested change, state that documents supporting the request are available for inspection at specified locations, and state that persons may comment by writing or calling (followed by written confirmation to) the Commission within 15 days of the notification date. Any delay in receipt of written confirmation will not delay Commission action on the proposed change. Con Edison shall not execute any proposed change to the EM&CP until it receives oral or written approval from the Commission or a designee, except in emergency situations threatening personal injury, property damage or severe adverse environmental impact or as specified in the EM&CP.

11. Con Edison shall make available to the public a toll free or local telephone number of an agent or employee who will receive complaints made during construction of the certified facilities. In addition, the Commission's telephone number, and the telephone number of its Environmental Compliance Section, shall be provided in the event of any questions or concerns. Telephone complaints shall be logged and made available to DPS Staff upon request. During Staff's compliance inspections, the Company shall report to Staff every unresolved complaint.

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12. Before commencing site preparation, Con Edison shall give notice to the NYSDOT, Commissioners of Public Works for Westchester County, the City of Mount Vernon, Village of Pelham and the City of New Rochelle. Such notice shall contain a map and description of the project in the local area, the anticipated date for start of construction and name, address and toll-free or local telephone number of an employee or agent of the Company. The notice shall also contain a statement that, pursuant to Article VII of the PSL, the Project is under the jurisdiction of the Commission, which is responsible for enforcing compliance with applicable environmental and construction conditions contained in Commission Orders, and which can be contacted at an address and telephone number to be provided. Whenever possible, the notice shall be written in terms reasonably understandable to the average person, as determined by the Company. A copy of the notice shall be submitted to the Secretary of the Commission.

13. Con Edison shall provide its construction contractors complete copies of the Certificate for the Project, the Project's EM&CP, and 6 NYCRR Parts 700-704.

14. The authority granted in the Certificate for the Project and any subsequent Commission Order(s) in this proceeding are subject to the following conditions which are necessary to ensure compliance with such Order(s):

(a) Con Edison shall regard the DPS Staff representatives (authorized pursuant to PSL Section 8) as the Commission's designated representatives in the field. In the event of any emergency resulting from the specific construction or maintenance activities that violate or may violate the terms of the Certificate or any other Order in this proceeding, such Staff representatives may issue a stop-work Order for that location or activity.

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(b) A stop-work Order shall expire within 24 hours unless a single Commissioner confirms it. If a stop-work Order is confirmed, Con Edison may seek reconsideration from the confirming Commissioner or from the Commission. If the emergency prompting the issuance of a stop-work Order is resolved to the satisfaction of the Commissioner or the Commission, the stop-work Order will be lifted. If the emergency has not been satisfactorily resolved, the stop-work Order will remain in effect.

(c) Stop-work authority shall be exercised sparingly and with due regard to the potential economic costs involved and possible impact on construction activities. Before exercising such authority, the DPS Staff field representatives shall attempt (wherever practicable) to direct preventive or remedial action through the Company's representatives possessing comparable authority. In the event that DPS Staff field representatives issue a stopwork Order, neither Con Edison nor the contractor will be prevented from undertaking such safety-related activities as they deem necessary and appropriate under the circumstances.

(d) In the event of any emergency involving specific construction or maintenance activities that violate or threaten to violate the terms of the Certificate or any other Order in this proceeding, the DPS Staff field representatives may direct the Company to install appropriate mitigative measures or devices.

#### Notifications

15. Con Edison shall inform the Secretary of the Commission, DPS Staff and other affected agencies or parties at least five days before commencing construction of this Project.

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16. Con Edison shall provide DPS Staff and other affected agencies or parties monthly status reports summarizing the previous month's construction activity and indicating the locations where construction is scheduled for the next month.

17. Within ten days after the facility is placed in service and is supplying customer loads, the Company shall notify the Commission of this fact.

## **Right-of-Way Clearing**

18 Con Edison shall confine clearing, where required, and subsequent maintenance activity to the certified ROW and temporary construction areas required for horizontal boring operations.

19. Con Edison shall notify all construction contractors that the Commission may seek to recover penalties for violation of Commission Orders not only from the Company but also from its construction contractors, and that construction contractors may also be liable for other fines, penalties and environmental damage resulting from actions performed by contractor personnel working on this Project (from work directly or indirectly associated with this Project).

## **Transmission Line Construction**

20. Con Edison shall install sedimentation/erosion control devices to prevent sedimentation into water bodies (e.g., the Hutchinson River, Pelham Lake) and any associated wetlands during construction. The erosion control structures shall be installed prior to construction and shall remain in place while working within 100 feet of the water body or wetland. Erosion and sedimentation controls shall be maintained until the ROW has been revegetated and/or stabilized in accordance with pre-existing conditions.

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21. Con Edison shall take appropriate measures, as outlined in the EM&CP, to minimize fugitive dust and airborne debris from construction activity.

22. Noise mitigation procedures, as described in the EM&CP, shall be followed and DPS Staff shall be notified at least 24 hours in advance if unplanned weekend or holiday construction becomes necessary.

23. No vehicular or equipment access across or into streams or wetlands is permitted without provision of adequate protection. Equipment turnouts may be provided for machinery and equipment to pass at intervals in non-sensitive areas.

24. Con Edison shall instruct its contractors to park their vehicles and equipment in areas designated on EM&CP drawings, so as not to interfere with normal traffic and not to cause any safety hazard or interference with existing land uses.

### **Erosion Control**

25. In the areas of the ROW or substation sites subject to soil erosion, Con Edison shall install temporary erosion control devices as soon as practicable and appropriate, and as indicated in the Project's EM&CP.

## **Environmental Supervision**

26. Con Edison's environmental inspector, engineer or qualified designee shall be on site at the start-up of each field operation and during environmentally sensitive phases of construction in areas such as water crossings. Each environmental inspector, engineer or designee and construction inspector shall be equipped with sufficient documentation, transportation and communication equipment to monitor effectively contractor compliance with the provisions of this Order, applicable sections of the Public Service Law and the approved EM&CP.

27. Con Edison shall organize and conduct site compliance inspections as needed, but not less frequently than once a month, during the clearing, construction and restoration phases of the Project, and at least annually for two years after the Project is operational. Such inspections shall include a review of the status of all Certificate conditions, requirements, and Company commitments, as well as a field review of the Project, if necessary. Such inspections may also include:

(a) reviews of all complaints received, and their proposed or actual resolutions;

(b) reviews of any significant comments, concerns or suggestions made by the public, local governments or other agencies;

(c) reviews of the status of the Project in relation to the overall schedule established prior to the commencement of construction; and

(d) any other items the Company or DPS Staff consider appropriate. The Company will circulate a written record of the results of such inspections to involved agencies.

## **Right-of-Way and Maintenance**

28. Con Edison shall, if necessary, negotiate for temporary easements for construction purposes, which shall be identified in the EM&CP. Any temporary easement or construction areas not identified in the approved EM&CP shall be requested through changes thereto. Unless otherwise specified in the EM&CP, the Company shall, following restoration, let the temporary construction area re-vegetate naturally or return to its original land use to the extent that forest canopy development does not interfere with the inspection, operation or maintenance of the utility facilities.

29. No herbicides will be used for facility construction or maintenance. Con Edison shall employ appropriate non-chemical techniques and apply environmental restrictions in the Company's Detailed Specifications for Transmission Right-of-Way Vegetation Maintenance.

## **Conservation Measures**

30. Wherever ROW construction requires removal of topsoil for trench excavation, the topsoil shall be removed from the site and disposed of with other excavated subsoil material in keeping with conventional construction methods. At the time of backfill, select fills shall be placed around and above the Project, compacted and stabilized to pre-existing conditions. Topsoil shall be restored in accordance with original soil profiles generally not to exceed a maximum of twelve inches.

## **Cultural Resources**

31. Con Edison shall submit to the Commission the archaeologist's revised Phase I report describing the results of additional testing along the right-of-way and the basis for the decision concerning the design and extent of the testing.

32. Should archaeological materials be encountered during construction, the Company shall, in accordance with the Unanticipated Discovery Plan provided in Appendix D of the Application, stabilize the area and cease construction activities in the immediate vicinity of the find and protect the same from further damage. Within 24 hours of such discovery, the Company shall notify DPS Staff and OPHRP to determine the best course of action. No construction activities shall be permitted in the vicinity of the find until such time as the

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significance of the resource has been evaluated and the need for and the scope of impact mitigation has been determined.

33. Should human remains or evidence of human burials be encountered during the conduct of archaeological data recovery fieldwork or during construction, all work in the vicinity of the find shall be immediately halted and the remains shall be protected from further damage. Within 24 hours of any such discovery, the Company shall notify DPS Staff, OPRHP, and the State and local police.

34. Con Edison shall refrain from undertaking construction in areas where cultural resource surveys have not been completed and until such time as the results of any additional cultural resource surveys that are required have been reviewed by the appropriate authorities, including OPRHP and DPS Staff. DPS Staff shall be contacted prior to commencement of construction in any such areas.

#### **Other Facilities**

35. Con Edison shall engineer its facilities to be fully compatible with the operation of nearby electrical, gas and telecommunication facilities. The Company shall take remedial measures with regard to any existing cathodic protection system if, upon monitoring, such measures are indicated.

36. For the service life of the facility, Con Edison, to the extent practicable, shall coordinate maintenance excavation within public rights-of-way with that of adjacent electric, gas and telecommunication facilities.

37. The Company shall identify and mark-out all existing in-ground utilities in accordance with 16 NYCRR Part 753.

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## **Right-of-Way Restoration**

38. Within the limited areas where the disturbance of mowed ground cover may be required at the edges of a roadway ROW, a suitable seed mixture shall be applied to such areas to revegetate and stabilize the ROW or work area.

39. All trees over four inches in diameter (measured four feet above ground) or shrubs over four feet in height that are damaged or destroyed by Con Edison's activities during construction, operation, or maintenance, regardless of where located, shall be replaced by Con Edison with equivalent type trees or shrubs, except where:

- (a) not required by any approved EM&CP;
- (b) equivalent-type replacement trees or shrubs would interfere with the proper clearing, construction, operation, or maintenance of the Project;
- (c) replacement would be contrary to sound ROW management practices or to any approved long-range ROW management plan applicable to the project; or
- (d) a property owner (other than the company) on whose land the damaged or destroyed trees or shrubs were located declines a replacement.

40. Within ten days of the completion of final restoration activity, Con Edison shall notify the Secretary of the Commission that all restoration has been completed in compliance with the EM&CP.

41. This proceeding is continued, but shall be closed ten days after the ROW has been completely restored, unless the Secretary of the Commission finds good cause to continue the proceeding further.

By the Commission,

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IN WITNESS WHEREOF, the Parties hereto have this day signed and executed this Agreement.

# NEW YORK STATE DEPARTMENT OF PUBLIC SERVICE

# CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

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# Appendix A

## Local Ordinances Waiver Requests

Code/Section Requirement		Justification
Westchester County Code		
Chapter 813	Road Construction Specifications	
§ 813.71	Restricts storage of material on County roads to 20% of area or 100 feet in length	This Westchester Code section is unreasonably restrictive in view of the needs of consumers. The Project is designed to meet both near-term and anticipated long-term electric load growth in southeastern Westchester County. Con Edison's most recent ten-year load forecast projects a 6-megawatt overload on the remaining Cedar Street transformer as early as summer 2007. This projected overload condition at Cedar Street, if left uncorrected, would threaten network reliability in southeastern Westchester County and Con Edison's customers served from this substation. In an effort to complete the Cedar Street Project expeditiously to ensure that the required improvements are in place by summer 2007, Con Edison will seek to install over 100 feet of the transmission line per day, potentially requiring storage of materials in an area exceeding 100 feet in length. Allowing storage in excess of 100 feet will promote the rapid completion of construction and minimize impacts on traffic. To ensure safe and adequate traffic operations along County roads during construction, Con Edison will implement a Maintenance and Protection of Traffic Plan.
City of Mount Ve	rnon Code	
Chapter 178	Noise	Sections 178 A 14A E
§ 178-4.14A	Prohibits excessive noise in	restrictive in view of the needs of
	residential areas	consumers. The Project is designed to



Code/Section     Requirement     Justification       § 178-4.14B     Prohibits excessive noise in commercial areas     meet both near-term and anticipated long- term electric load growth in southern       § 178-4.14C     Prohibits excessive noise in construction area     meet both near-term and anticipated long- term electric load growth in southern       § 178-4.14D     Prohibits excessive noise in construction area     meet both near-term and anticipated long- term electric load growth in southern       § 178-4.14E     Prohibits excessive noise in noise-sensitive zones     network reliability and the provision of reliable electric service to Con Edison's customers who are served by the Cedar Street Substation, Con Edison requires the ability to extend construction activities beyond the hours prescribed in these sections to ensure that the required improvements are in place by summer 2007.       Chapter 227     Streets and Sidewalks     Inasmuch as portions of the roadways that comprise the preferred transmission route may have been paved within the last three years and would need to be disturbed as part of the installation of the Project, which is proposed to ensure network reliability in southeastern Westchester County, §227-50 is unreasonably restrictive in view of the needs of consumers. The Project, will be restored by Con Edison in accordance with applicable requirements.       Willage of Petham Code     Felace and Good Order       Article VII     Noise Control       § 68-26B     Prohibits unreasonable noise § 68-26B     Prohibits excessive noise from blasting, jack hammering, pile division and couch envelorer			
§ 178-4.14B       Prohibits excessive noise in commercial areas       meet both near-term and anticipated long- term electric load growth in southern         § 178-4.14C       Prohibits excessive noise in noise regulations. However, to maintain construction area       Westchester County and is intended to comply with the City of Mount Vernon noise regulations. However, to maintain network reliability and the provision of reliable electric service to Con Edison's customers who are served by the Cedar Street Substation, Con Edison requires the ability to extend construction activities beyond the hours prescribed in these sections to ensure that the required improvements are in place by summer 2007.         Chapter 227       Streets and Sidewalks         § 227-50       Prohibits the opening of newly paved streets for a period of three (3) years       Inasmuch as portions of the roadways that comprise the preferred transmission route way have been paved within the last three years and would need to be disturbed as part of the installation of the Project, which is proposed to ensure network which is proposed to ensure network which is proposed to ensure network streets paved within the last three years. Streets that are disturbed during construction of the Project, will be restored by Con Edison in accordance with applicable requirements.         Village of Pelham Code       Prohibits ureasonable noise § 68-26A       Prohibits ureasonable noise § 68-26A         Village of Pelham Code       Sections 68-26A-C are ureasonably restrictive in view of the needs of consumers. The Project is designed to meet both near-term and anticipated long- term electric hoad rear term and anticipated long- term electric hoad rear the rowed of consumers. The Project is designed to meet both	Code/Section	Requirement	Justification
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§ 178-4.14E       Prohibits excessive noise in noise-sensitive zones       reliable electric service to Con Edison's customers who are served by the Cedar Street Substation, Con Edison requires the ability to extend construction activities beyond the hours prescribed in these sections to ensure that the required improvements are in place by summer 2007.         Chapter 227       Streets and Sidewalks         § 227-50       Prohibits the opening of newly paved streets for a period of three (3) years         pay ext streets for a period of three (3) years       Inasmuch as portions of the roadways that comprise the preferred transmission route may have been paved within the last three years and would need to be disturbed as part of the installation of the Project, which is proposed to ensure network reliability in southeastern Westchester County, §227-50 is unreasonably restrictive in view of the needs of consumers. The Project is intended to comply with the City of Mount Vernon street and sidewalk regulations. However, Con Edison requires the ability to open streets paved within the last three years. Streets hat are disturbed during construction of the Project, will be restored by Con Edison in accordance with applicable requirements.         Village of Pelham Code       Sections 68-26A-C are unreasonably restrictive in view of the needs of consumers. The Project is designed to meet booth near-term and anticipated long-term enderticipated long-term enderticipated long-term of the moles of consumers. The Project is designed to meet booth near-term and anticipated long-term of a dargowith incluse the orden the orden the orden the orden the orden the orden to endertowith endertowith end and the profect is designed to meet booth near-term and anticipated long-term of and arouphis nothendered.		construction area	network reliability and the provision of
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§ 68-26B Prohibits excessive noise from blasting, jack hammering, pile driving and rock graviting	§ 68-26A	Prohibits construction activities	restrictive in view of the needs of
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driving and roak grupping term electric load growth in southeastern	5	blasting, jack hammering, pile	meet both near-term and anticipated long-
and fock crushing form ciccure to ad growth in southeastern		driving and rock crushing	term electric load growth in southeastern

Code/Section	Requirement	Justification
§ 68-26C	Restricts the operation of power tools or equipment	Westchester County and is intended to comply with the Village of Pelham noise regulations. However, to maintain network reliability and the provision of reliable electric service to Con Edison's customers who are served by the Cedar Street Substation, Con Edison requires the ability to extend construction activities beyond the hours prescribed in these sections to ensure that the required improvements are in place by summer 2007.
City of New D		
Chapter 213	Noise	
§ 213-19	Prohibits excessive noise in residential areas	Sections 213-19-23 are unreasonably restrictive in view of the needs of
§ 213-20	Prohibits excessive noise in commercial areas	consumers. The Project is designed to meet both near-term and anticipated long
§ 213-21	Prohibits excessive noise in manufacturing areas	term electric load growth in southeastern Westchester County and is intended to
§ 213-2	Prohibits excessive noise in construction area	comply with the City of New Rochelle noise regulations. However, Con Edison's
§ 213-23	Prohibits excessive noise in noise-sensitive zones	most recent ten-year load forecast projects a 6-megawatt overload on the remaining Cedar Street transformer as early as summer 2007. This projected overload condition at Cedar Street, if left uncorrected, would threaten network reliability in southeastern Westchester County and Con Edison's customers served from this substation. Therefore, to expedite construction of the Project in an effort to ensure that the required transmission improvements are in place by summer 2007, Con Edison requires the ability to extend construction activities beyond the hours prescribed in these sections.
Chapter 281	Streets and Sidewalks and Public Places	
§ 281-10	Prohibits the opening of newly paved streets for a period of three (3) years	Inasmuch as portions of the roadways that comprise the preferred transmission route may have been paved within the last three years and would need to be disturbed as

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Lode/Section	Requirement	Justification
		part of the installation of the Project, which is proposed to ensure network reliability in southeastern Westchester County, §281-10 is unreasonably restrictive in view of the needs of consumers. The Project is designed to meet both near-term and anticipated long- term electric load growth in southeastern Westchester County and is intended to comply with the City of New Rochelle street and sidewalk and public places regulations. However, Con Edison requires the ability to open streets paved within the last three years. The criteria considered by Con Edison in selecting the preferred route is detailed in Exhibit 3, Alternatives.

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## Appendix **B**

# Motion For Waivers Of Application Requirements

Section	Requirement	Justification
16 NYCRR		
§ 86.3(a)(1)(i)	Submit detailed maps, drawings and explanations for the proposed right-of-way covering an area of at least five miles on either side of the proposed facility location.	Con Edison requests a modification of the requirement to submit detailed maps, drawings, and explanations, including New York State Department of Transportation ("NYSDOT") 1:24,000 scale maps showing the proposed right-of-way covering an area of at least five miles on either side of the proposed facility location. As set forth in the Application, the Project consists of a short length (approximately 3.0 miles) of transmission line extending from the existing Washington Street Substation to the existing Cedar Street Substation in Westchester County. Given that the new transmission line will be located . entirely underground and that the substation improvements required in support of the new transmission line will be completed within the existing fence and property lines of the Washington Street and Cedar Street Substations, Con Edison requests that the Commission modify the requirements of § 86.3(a)(1) and allow Con Edison to provide NYSDOT maps, drawings and explanations for the proposed rights-of-way and substation facilities covering an area of one mile on either side of the Project components
§ 86.3(a)(1)(iii)	Submit detailed maps, drawings and explanations for known archaeologic, geologic, historical or scenic area, park or untouched wilderness on or within three miles of the right- of-way.	Con Edison requests a modification of the requirement to submit detailed maps, drawings, and explanations relating to any "known archaeologic, geologic, historical, or scenic area, park, or untouched wilderness on or within three miles of the right-of-way." As set forth in the Application, the proposed transmission line will be located entirely underground along existing roadway rights-of- way. The proposed substation improvements required in support of the new transmission line will be completed within the existing fence

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Section	Requirement	Justification
		and property lines of the Washington Street
		and Cedar Street Substations. Consequently,
		Con Edison requests that the Commission
		reduce the $\$$ 86.3(a)(1)(iii) three-mile radius to
		a radius within one mile of the Project rights
		of-way.
§ 86.3(a)(2)	Submit detailed maps,	Con Edison requests a waiver of the
	drawings and	requirement to submit detailed mans drawings
	explanations for the	and explanations, including NYSDOT
	right-of-way of the	1:250,000 scale maps showing the relationship
	proposed facilities,	of the proposed facility to Con Edison's overall
	including NYSDOT	system. Given the limited impact and short
	maps showing the	distance of the Project's proposed transmission
	relationship of the	line and given that the interface of the
	proposed facility to the	proposed facilities with the existing Con
	Applicant's overall	Edison transmission system is limited to the
	system.	interconnection at the existing Washington
		Street and Cedar Street Substations, which are
		clearly shown in Figure 2-1 of the Application
		Con Edison requests that the Commission
		waive the requirement of $\S$ 86 3(a)(2)
§ 86.3(b)(2)	Submit detailed maps,	Con Edison requests a waiver of the
	drawings and	requirement to submit detailed maps, drawings
	explanations for the	and explanations for the rights-of-way of the
	right-of-way of the	proposed facilities, including aerial
	proposed facilities,	photographs of urban areas and urbanizing
	including aerial	fringe areas taken within six months of the date
	photographs of urban	of filing. The timing of the engineering design
	areas and urbanizing	of the Project has resulted in the unavailability
	fringe areas taken within	at the date of Application filing of confirmed
	six months of the date of	current (i.e., within six months of date of
	filing.	filing) aerial photography for the project's
		preferred route. Con Edison has substituted for
		this photography, 0.5-foot ground resolution
		orthophotographs, dated 2004, obtained from
		the New York State GIS Clearinghouse. Con
		Edison believes that due to the fact that the
		entire route of the proposed transmission
	· · ·	corridor is located within existing public
		roadway rights-of-way, which are developed
		with urban/suburban development that pre-date
		the six month period prior to the submittal of
		this application, that the substituted aerial
		photography obtained from the New York
		State GIS Clearinghouse is sufficiently recent

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Section	Requirement	Justification
		to meet the Commission's needs for its review of the Application. Accordingly, Con Edison
		requests that the Commission waive the six-
		to this portion of the Application's with respect
		photography
§§ 86.6(b) and (c)	Submit design, profile	Con Edison requests a waiver of the
	and architectural drawings and descriptions, including	requirement that (i) design drawings and descriptions of the material of construction, color and finish of proposed structures and (ii)
	material of construction, color and finish; and a profile of the centerline of the right-of-way at	a profile of the centerline right-of-way for the route of the proposed transmission line be submitted upon filing of the Application. Final details with respect to the Project's
	exaggerated vertical scale.	transmission line right-of-way centerline are not yet complete. Moreover, the limited substation improvements required in support of
		the new transmission line will be completed within the existing fence and property lines of the Washington Street and Cedar Street
	-	Substations. Con Edison intends to provide these design details for the new transmission
		the Commission for review and approval in the Project's Environmental Management and
		Construction Plan. Accordingly, Con Edison seeks a waiver of the provisions of §§ 86.6(b)
		and (c) that require the submittal of this final engineering design information upon filing of the Application
§ 88.4(a)(4)	Provide appropriate	Con Edison requests a waiver of the
	system studies, showing expected flow on the line under normal, peak and emergency conditions, including offects on	requirement to provide appropriate system studies, showing expected flows on the transmission line under normal, peak and emergency conditions, including effects on
	stability of the interconnected system.	Stability of the interconnected system. Con Edison believes that system power flow studies for the Cedar Street Project are unnecessary. As reflected in the Application and, more
		Table E-4.1, the proposed Cedar Street 3 <sup>rd</sup> transformer will only be supplied from one of the existing 138 kV radial feeders which runs
		from Dunwoodie North 138 kV substation to the Washington Street area substation Loading
Section	Requirement	Justification
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		on the feeder which will supply the Cedar
		Street 3 <sup>rd</sup> transformer will depend entirely on
		the load served by the Cedar Street substation,
		i.e., each feeder will supply one-third of the
		substation load during normal conditions and
		one-half of the load during first contingency
		(emergency) conditions. Given the radial
		supply of the proposed 3 <sup>rd</sup> transformer
		installation at the Cedar Street area substation
		from the existing Dunwoodie North 138 kV
		substation, power will always flow
		unidirectionally from the Dunwoodie North
		substation to the Cedar Street substation.
		Consequently, with no other source of flow,
		there are no system impacts, and feeder and
		substation transformer flows can be easily
		calculated from the load supplied by Cedar
		Street.
		The Cedar Street substation presently
		supplies the Cedar Street load area. As
		indicated in Table E-4.1 of the Application,
		without the proposed Project, the Cedar Street
		area substation will exceed its emergency
		rating during peak load and first contingency
	Ξ.	conditions, affecting the supply of the load area
		beginning in 2007. With the proposed Project,
		the capability of the Cedar Street substation
		will be increased to eliminate the potential
		substation overload. Thus the Cedar Street
		Project will have no overall effect on system
		loads. Consequently, Con Edison requests that
		the Commission waive the system studies
		requirement of § $88.4(a)(4)$ and utilize the
		information currently provided in the
		Application and supporting exhibits.

# Affidavits of Sponsoring Witnesses

IN THE MATTER of the Application of : Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

CASE NO. 05-T-1369

# AFFIDAVIT OF SPONSORING WITNESS

James Shannon, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

•

x

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my pre-filed direct testimony are true and correct.

3. I sponsor the responses to Department Staff interrogatories (as supplemented) as part of the evidentiary record in this proceeding.

4. I adopt the testimony as my sworn statement in this proceeding.

JAMES SHANNON

Sworn to before me this  $31^{2}$  day of March 2006

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IN THE MATTER of the Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, Westchester County, New York

CASE NO. 05-T-1369

# AFFIDAVIT OF SPONSORING WITNESS

Y

x

Joseph Liberatori, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my prefiled direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

JOSEPH LIBERATORI

Sworn to before me this day of March 2006

IN THE MATTER of the Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

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CASE NO. 05-T-1369

# **AFFIDAVIT OF SPONSORING WITNESS**

X

Jairo Gomez, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my prefiled direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

Sworn to before me this 3/ day of March 2006

Much effelles frank

IN THE MATTER of the Application of : Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

## CASE NO. 05-T-1369

#### AFFIDAVIT OF SPONSORING WITNESS

Х

Amitabha Mukhopadhyay, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. I am using this affidavit to correct certain minor errors associated with my pre-filed direct testimony in this proceeding. Specifically, my pre-filed testimony, at p. 2, Line 17, makes reference to Application Exhibit 4, Section 4.11 - Transmission Line Electric and Magnetic Fields. This reference should be corrected to read Section 4.10. My pre-filed testimony, at p. 2, Line 18, also makes reference to Application Appendix C – EMF Calculation Sheet. This Appendix C was inadvertently omitted from the Application at the time of submittal, but has been comprehensively addressed in Con Edison's responses to Department Staff interrogatories submitted December 23, 2005, as supplemented February 6, 2006.

3. Further, as may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my pre-filed direct testimony are true and correct.

4. I adopt the testimony as my sworn statement in this proceeding.

ΑΜΙΤΑΒΗΑ ΜΙΚΗΦΡΑΟΙ

Sworn to before me this day of March 2006

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IN THE MATTER of the Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and ; Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, Westchester County, New York

#### CASE NO. 05-T-1369

# **AFFIDAVIT OF SPONSORING WITNESS**

Arnold Wong, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my prefiled direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

Sworn to before me this 3/ day of March 2006

fillo Frasa

IN THE MATTER of the Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

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CASE NO. 05-T-1369

# **AFFIDAVIT OF SPONSORING WITNESS**

Raymond Pasquariello, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my prefiled direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

OND PASQUARIELLO

Sworn to before me this  $\mathscr{I}_{\mathbb{Z}}^{\mathbb{Z}}$ day of March 2006

DEBORAH A. LANNI NOTARY PUBLIC - RHODE ISLAND MY COMMISSION EXPIRES

SEPTEMBER 11TH, 2007

IN THE MATTER of the Application of : Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

### CASE NO. 05-T-1369

## **AFFIDAVIT OF SPONSORING WITNESS**

— x

Brian E. Dempsey, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my pre-filed direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

BRIAN E. DEMPSEY

Sworn to before me this  $2\frac{4}{2}$  day of March 2006

Public

ANGELA PARODI NOTARY PUBLIC-STATE OF NEW YORK No. 01PA6112459 Qualified in Westchester County Commission Expires July 06, 20<u>98</u>

IN THE MATTER of the Application of : Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

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CASE NO. 05-T-1369

## **AFFIDAVIT OF SPONSORING WITNESS**

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Craig H. Wolfgang, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my pre-filed direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

Sworn to before me this 27 day of March 2006

ulisem mcRuver atary Public

JACQUELINE M. MCKEEVER NOTARY PUBLIC, STATE OF NEW JERSEY MY COMMISSION EXPIRES APRIL 5, 2007

IN THE MATTER of the Application of : Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and : Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project, : Westchester County, New York

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CASE NO. 05-T-1369

#### **AFFIDAVIT OF SPONSORING WITNESS**

Kevin Maher, being duly sworn, deposes and says:

1. I submitted pre-filed direct testimony in the above-captioned matter.

2. As may be modified by the Project's re-design from two transmission feeders to a single feeder, as described in Con Edison's February 6, 2006 submittal to Judges Bouteiller and Liebschutz, and as similarly modified in Con Edison's supplemental responses to Department Staff interrogatories, submitted February 6, 2006, all made part of the evidentiary record in this proceeding, the answers to the questions and the information contained in my prefiled direct testimony are true and correct.

3. I adopt the testimony as my sworn statement in this proceeding.

Sworn to before me this 274 day of March 2006

ire M MCRouce

JACQUELINE M. MCKEEVER NOTARY PUBLIC, STATE OF NEW JERSEY MY COMMISSION EXPLICES APRIL 5, 2007



CASE 05-T-1369 - Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project in Westchester County.

# JOINT STATEMENT IN SUPPORT OF JOINT PROPOSAL

April 5, 2006

Consolidated Edison Company of New York, Inc.

Staff of the New York State Department of Public Service

CASE 03-T-1385 - Application of Consolidated Edison Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the Public Service Law for the Cedar Street Project in Westchester County.

> Joint Statement of Consolidated Edison Company of New York, Inc., and Staff of the New York State Department of Public Service

#### BACKGROUND

On November 1, 2005, Consolidated Edison Company of New York, Inc. ("Con Edison" or the "Applicant") filed an application and supporting testimony (together, the "Application") with the New York State Public Service Commission (the "Commission") seeking a Certificate of Environmental Compatibility and Public Need pursuant to Article VII of the New York State Public Service Law ("PSL") for the construction, operation, and maintenance of up to two 138 kilovolt (kV) electric transmission feeders along a single, underground transmission line route, approximately three miles long, in southeastern Westchester County, New York ("Westchester County" or the "County"). The Application proposed that the feeders and associated equipment (including two 138 kV – 13.8 kV transformers at Con Edison's existing Cedar Street Substation) would connect Con Edison's existing Washington Street Substation in the City of Mount Vernon with its Cedar Street Substation in the City of New Rochelle. In the Application, Con Edison also sought waivers of the requirements of 16 NYCRR §§ 86.3(a)(l)(i) and (iii); 86.3(a)(2) and (b)(2); 86.6(b) and (c); and 88.4(a)(4). On November 21, 2005, the Secretary of the Commission issued a letter stating that the Application was in compliance with PSL §122 as of its filing date. In accordance with public notices issued by the Commission and by the Applicant at the Presiding Officer's direction, a public statement hearing was held in New Rochelle, New York, on January 19, 2006, before Presiding Officer Elizabeth Liebschutz.

By letter dated February 6, 2006, Con Edison indicated that it had re-evaluated its longterm forecast in light of new developments for anticipated area load growth projects and determined that the construction of a second transmission feeder, as described in the Application, was no longer justified. Con Edison's February 6 letter provided minor revisions to the Application to reflect this change in scope, amending the Application to allow for construction, operation and maintenance of a single, underground 138 kV electric transmission feeder along the same transmission route as previously proposed. The single feeder and associated equipment (including one 138 kV – 13.8 kV transformer at the Cedar Street Substation) will still connect between Con Edison's Washington Street Substation and its Cedar Street Substation (the "Project").

The parties have had the opportunity to engage, and have engaged, in written discovery of the Applicant, and the record for this proceeding, as described in the Joint Proposal, includes 17 data requests from New York State Department of Public Service Staff ("DPS Staff") to Con Edison, and the responses and supplemental responses to those requests. Parties to this proceeding have also conducted field investigations of the proposed transmission line route and have met with Con Edison representatives regarding the Application.

The evidentiary record in this proceeding consists of the Application, testimony and exhibits of Con Edison, filed November 1, 2005 and revised by letter dated February 6, 2006, as well as Con Edison's responses to DPS Staff's interrogatories, submitted under cover of letter dated December 23, 2005, as supplemented on February 6, 2006.

#### DESCRIPTION OF THE CEDAR STREET PROJECT

The Project will consist of a single transmission line containing one electrical feeder to be installed entirely underground and within existing Con Edison property, public roadway rights-of-way ("ROW") and easements as may be required from the New York State Thruway Authority ("NYSTA") and Westchester County. The feeder, totaling approximately three miles in length and operating at 138 kV, would consist of a three-phase, single copper conductor solid dielectric insulated cable circuit. Each feeder cable will be installed in a fiberglass reinforced epoxy ("FRE") conduit. The conduits will be arranged in a duct bank with four conduits (one for each phase, plus one spare) in a square configuration, buried approximately three feet below grade. A steel plate will be placed over the duct banks to provide additional protection from external loads and unauthorized excavations. The line would connect Con Edison's Washington Street Substation in Mount Vernon with its Cedar Street Substation in New Rochelle. Equipment required to accommodate the new feeder will be added at both the Washington Street and Cedar Street Substations, including installation of a 138/13.8 kV transformer at the Cedar Street Substation.

The proposed route for the transmission line begins at Con Edison's Washington Street Substation and heads east along Hartford Avenue for a distance of approximately 1,300 feet to the intersection with South Columbus Avenue. The route continues north along South

Columbus Avenue, for approximately 100 feet to the intersection with Beechwood Avenue. At Beechwood Avenue, the route turns east and continues for a distance of approximately 1,300 feet to the intersection of Bradford Road. At Bradford Road the route travels northeast for approximately 200 feet and passes underneath the New Haven Line of the Metro-North Railroad and enters Wilson Woods Park. The route continues northeast through the park along Wilson Woods Park Road for approximately 2,200 feet. Before the intersection of Lincoln Avenue, the route turns east, crossing the Hutchinson River Parkway and Hutchinson River via directional drilling to a location near the intersection of Lincoln Avenue and First Avenue. The route then continues east along Lincoln Avenue for approximately 7,600 feet to the intersection with North Avenue. East of North Avenue, Lincoln Avenue becomes Manor Place. The route continues northeast through the North Avenue intersection onto Manor Place for approximately 500 feet to The Circle. The route travels south for approximately 350 feet along The Circle then intersects Manhattan Avenue. On Manhattan Avenue, the route turns northeast for approximately 575 feet and veers south onto vacant NYSTA property, adjacent to the southbound exit lane of Interchange 16 of the New England Thruway (I-95). The route continues southeast for approximately 1,300 feet, crossing both southbound exit and entrance lanes of the Thruway and passes under the 8-lane New England Thruway overpass and under Metro-North's New Haven Line (which is also used by Amtrak between New Rochelle and New Haven) to the intersection of Commerce Street and Cedar Street, at which point the route turns south and continues along Commerce Street for approximately 125 feet to the gated driveway leading into the walled Cedar Street Substation.

#### SETTLEMENT NEGOTIATIONS

Through discovery, a public hearing, exploratory discussions and site investigations, the parties identified issues requiring further review and discussion. Efforts to assess the feasibility of resolving this proceeding through the vehicle of a Joint Proposal began January 13, 2006, when Con Edison distributed a draft proposal to DPS Staff for informal review and comment. On January 30, 2006, as supplemented by letter dated February 7, 2006, Con Edison filed with the Commission's Secretary and the Presiding Officers, and served on all parties on the Commission's Active Party List for this case, a notice that settlement negotiations would take place on February 15, 2006, at Con Edison's regional headquarters in Rye, New York.

On February 7, 2006, Con Edison formally circulated drafts of a Joint Proposal, proposed Ordering Clauses, and an Environmental Management and Construction Plan ("EM&CP") to all parties on the Commission's Active Party List. During its review of the Application as supplemented by discovery, DPS Staff came to the conclusion that the Project was needed, was appropriately sited, and was consistent with the State's long-range energy plans. The focus of the parties' negotiations concerned the timeframe for resolution of anticipated easements or revocable consents for certain roadway crossings along the Project's route, and detailed requirements for the Article VII certificate conditions and the EM&CP. The parties worked together on developing a Joint Proposal, Ordering Clauses and an EM&CP that would minimize potential adverse environmental impacts (including traffic impacts). Based on the record, the representations of the parties, the minimal comments received at the Commission's public statement hearing, and the lack of negative comments regarding the Project, it appears appropriate to resolve the Application by a Joint Proposal.

Representatives of Con Edison and DPS Staff attended the February 15, 2006 settlement negotiations. At the settlement conference, the participating parties discussed drafts of the Joint Proposal, Ordering Clauses and EM&CP. At the settlement conference and thereafter, the parties submitted proposed additions and revisions to these documents. Con Edison incorporated many of these modifications and additions in the draft Joint Proposal, Ordering Clauses and EM&CP and re-circulated these documents to the interested parties on March 15, 2006. Con Edison, DPS Staff, and Staff of the New York State Department of Transportation ("DOT Staff") participated in additional negotiations via telephone and e-mail regarding the revised documents. As a result of these negotiations, Con Edison, and DPS Staff have reached accord on the terms of a Joint Proposal and supporting appendices for approval by the Commission. The settling parties are unaware of any opposition to the Joint Proposal from any person or entity on the Commission's Active Party list.

#### SUMMARY OF SETTLEMENT

The settlement documents include the Joint Proposal, with appendices, and this Joint Statement in Support. The appendices to the Joint Proposal are: Appendix A – Local Ordinances Waiver Requests; Appendix B – Requested Waivers of Application Requirements; Appendix C – Environmental Management and Construction Plan. Affidavits of sponsoring witnesses are also annexed to the Joint Proposal.

The Joint Proposal establishes the terms and conditions for the construction, operation, and maintenance of the Project consistent with applicable regulations, policy and guidance of the Commission and the New York State Departments of Environmental Conservation and Transportation. The Joint Proposal first establishes general conditions for the construction of

the Project and proposes Commission adoption of the EM&CP filed in conjunction with the Joint Proposal by the Applicant. The Joint Proposal requires that Con Edison maintain contact with municipal authorities and the public during the construction phase of the Project through the provision of specified notices and the establishment of a telephone line to receive comments or complaints regarding Project activities. The Joint Proposal further establishes requirements for periodic reporting to DPS Staff, DOT Staff, and other state and local agencies, as applicable, addresses erosion control and the clearing, restoration and maintenance of rights-of-way, identifies certain limitations on transmission line construction, establishes criteria for environmental supervision of the Project during its construction and operational phases, and delineates procedures to be followed for the protection of archeological resources.

In the Joint Proposal, the parties hereto have agreed:

- 1. The Commission may make the findings required for issuance of a Certificate of Environmental Compatibility and Public Need (Article VII Certificate) pursuant to PSL §126.
- 2. The record adequately describes the facilities.
- 3. The record establishes the need for the Project.
- 4. The record shows that the Project will have minimal impacts on the environment, considering the state of available technology and the nature and economics of the various alternatives.
- 5. The Project is consistent with the most recent New York State Energy Plan by providing load distribution relief that will help maintain the reliability of the existing electric system transmission and distribution infrastructure.
- 6. The Project conforms to applicable state and local laws, except those for which the Applicant has sought waiver.
- 7. The Project will serve the public interest, convenience and necessity.
- 8. The proposed Ordering Clauses, if implemented, will insure that the Project will comport with the parties' expectations on the protection of the environment, because the trenching operation for laying cable is expected to produce only localized and

temporary effects and the Project is otherwise confined almost exclusively to existing roadway and electric transmission line rights-of-way within easements along already disturbed industrial property.

## SUFFICIENT NOTICE WAS PROVIDED TO ALL INTERESTED PARTIES

All parties received reasonable and sufficient notice of the settlement negotiations as required by 16 NYCRR §3.9(a). As noted above, on January 30, 2006, Con Edison served on all parties on the Commission's Active Party List a Notice of Impending Negotiation advising all parties of the negotiations. Thereafter, on February 7, 2006, Con Edison served the draft Joint Proposal, proposed Ordering Clauses and EM&CP on all those parties. This notice was reasonable and gave all interested parties the opportunity to participate in the settlement negotiations.

#### THE JOINT PROPOSAL RESOLVES ALL CONCERNS WITH THE PROJECT

Based on the Application, the prepared testimony and the discovery responses, the parties to this agreement recognize that the Project meets the requirements of PSL § 126 and associated regulations. The Joint Proposal, proposed Ordering Clauses and proposed EM&CP insure that the Project will comply with the requirements of the Public Service Law and relevant regulations. The parties agree that, if the Commission adopts the provisions of the Joint Proposal and its appendices, the Project will meet the requirements of the PSL and relevant regulations as set forth in the Joint Proposal. The Joint Proposal was reached in compliance with the Commission's settlement regulations and guidelines. The Joint Proposal represents a fair and equitable compromise regarding the Application, and the parties to the Joint Proposal urge that the Commission rely on this Joint Statement in Support and the Joint Proposal and appendices to make the findings required by Public Service Law §126.

#### CONCLUSION

For the foregoing reasons, the settling parties request that the Commission accept this Joint Statement in Support, the Joint Proposal, and the appendices to the Joint Proposal. Based on these documents, the Commission should reach the conclusions required by PSL §126(1), grant a Certificate of Environmental Compatibility and Public Need and approve an EM&CP for the Project. The settling parties further request that the Commission issue the requisite Order granting Certificate of Environmental Compatibility and Public Need and approving Environmental Management and Construction Plan at its May 2006 meeting, so that construction of the Project can begin to meet a targeted pre-summer peak completion date of May 2007.

This Joint Statement in Support is being executed in counterpart originals, and shall be binding on each signatory party when all counterparts have been executed.

Dated: April 5, 2006

Respectfully submitted,

CONSOLIDATED EDISON COMPANY OF NEW

Bv:

Eric M. Dessen, Esq. 4 Irving Place – Room 1820 New York, NY 10003

STAFF OF THE NEW YORK STATE DEPARTMENT OF PUBLIC SERVICE

By:

Steven Blow, Esq. Three Empire State Plaza Albany, NY 12223



# **CEDAR STREET PROJECT**

# ENVIRONMENTAL MANAGEMENT AND CONSTRUCTION PLAN

Prepared for

Consolidated Edison Company of New York, Inc. 4 Irving Place New York, New York 10003

Prepared by

**TRC Environmental Corporation** 1200 Wall Street West Lyndhurst, New Jersey 07071

April 5, 2006

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# **1** INTRODUCTION

On November 1, 2005 Con Edison filed an application (the "Application") with the New York State Public Service Commission (the "Commission") seeking a certificate of environmental compatibility and public need pursuant to Article VII of the Public Service Law ("PSL") for the construction and operation of an underground 138 kilovolt ("kV") electric transmission feeder along a single transmission line route, approximately three miles long, in southeastern Westchester County, New York ("Westchester County" or the "County"). The feeder will connect Con Edison's existing 138/13.8 kV Washington Street Substation in the City of Mount Vernon with Con Edison's existing 138/13.8 kV Cedar Street Substation located in the City of New Rochelle (the "Project").

This document, referred to as the Transmission Line Environmental Management and Construction Plan ("EM&CP"), focuses on the "Best Management Practices" ("BMPs") to be followed during transmission line construction to minimize impacts to the environment (i.e., construction sequence, soil erosion and sediment control measures, landscaping and site restoration, etc.). This document also includes a Construction Storm Water Pollution Prevention (CSWPP) Plan / EM&CP for the addition of a third 138/13.8 kV transformer at the Cedar Street Substation.

Guidance for "Best Management Practices" applicable to the Cedar Street Project was obtained from the following regulatory programs and documents:

- Title 6, New York Code of Rules and Regulations ("NYCRR") Part 750 et seq., also known as the State Pollutant Discharge Elimination System regulations;
- New York Guidelines for Urban Erosion and Sediment Control, Soil and Water Conservation Society, Empire State Chapter, Fourth Printing April 1997;
- Erosion and Sediment Control, Best Management Practices Manual Series, Westchester County, N.Y., 1991;
- Storm Water Management, Best Management Practices Management Series, Westchester County, N.Y., 1984; and
- Environmental Management and Construction Standards and Practices for Underground Transmission and Distribution Facilities in New York State, NYS Department of Public Service. Revised, Interim – February 18, 2003.

Specific responsibilities for complying with the Order that grants the Certificate and approves the EM&CP remain with Con Edison, while the responsibilities for project construction will be shared between Con Edison and its construction contractor, with Con Edison being principally responsible. Key steps and responsibilities associated with plan implementation are highlighted below:

- 1. Develop an EM&CP for construction activities (Con Edison).
- 2. Maintain a copy of the EM&CP at the main construction field offices for both Con Edison and the contractor (Con Edison and Construction Contractor).
- 3. Implement and maintain the erosion and sediment controls for construction activities as set forth in the EM&CP (Con Edison and Construction Contractor).
- 4. Routinely inspect the erosion and sediment controls and prepare and maintain inspection reports with authorized signatures (Engineer Inspector or Chief Construction Inspector referred to as EI or CCI).
- Update/prepare revisions to the EM&CP to accurately reflect route changes, control measure changes, or in response to a Reportable Quantity release (as referenced, 40 CFR 110, 40 CFR 117 and 40 CFR 302) (Construction Contractor).
- 6. All spills should be reported to the Con Edison Central Information Group (CIG) using the procedures outlined in Section 15.8. The CIG will notify, as appropriate, the emergency response contractor, local emergency responders (police, fire, ambulance), and appropriate regulatory agency staff (Westchester County Department of Health, New York State Department of Environmental Conservation ("NYSDEC"), and U.S. Environmental Protection Agency ("USEPA")) as soon as knowledge of a discharge equal to or greater than the Reportable Quantity or standard for oil or a hazardous substance is obtained (Con Edison, Contractor and CIG).
- 7. Modify the EM&CP, as necessary, within 14 days of knowledge of the release of a Reportable Quantity, including a description of the release of oil or hazardous substance, the circumstances leading up to the release, an estimate of the amount of the release, and the steps that will be taken in response to the release (Con Edison).
- 8. Retain the EM&CP and all construction records for a period of at least three years following final site stabilization: A copy of the EM&CP and all pertinent records shall be maintained at the construction field office for the duration of construction activity (Con Edison and Construction Contractor).

The remainder of this document outlines the structural and non-structural controls that will be implemented during construction activities. The specific controls were chosen to address the site-specific erosion and sediment control issues applicable to site characteristics and proposed construction activities.

# 2 GENERAL INFORMATION AND EM&CP ORGANIZATION

#### 2.1 **Project Description**

The new 138 kV underground transmission line, totaling approximately three miles in length and operating at 138 kV, would consist of copper dielectric cables installed in a fiberglass reinforced epoxy ("FRE") conduit. The line would connect Con Edison's Washington Street Substation in Mount Vernon with its Cedar Street Substation in New Rochelle. Equipment required to accommodate the feeder will be added at both the Washington Street and Cedar Street Substations, including installation of a 138/13.8 kV transformer at the Cedar Street Substation.

Horizontal directional drilling or other trenchless installation will be used to install the duct bank across the Hutchinson River Parkway and adjacent Hutchinson River to avoid the disruption of traffic and water quality impacts. Due to limitations on the continuous available length of solid dielectric cable, concrete vaults will be installed approximately every 1,200 to 1,500 feet along the route. The vaults will serve as locations for pulling the solid dielectric cable through the individual conduits and for splicing the cable. The vaults will be underground structures approximately 18 feet long by 7 feet wide, accessible via two manhole covers and set flush to grade. The precise centerline of the transmission line route, along with the location of the horizontal directional drilling and receiving pits and the manhole locations, are shown on the Plan and Profile drawings.

The proposed route for the transmission line begins at Con Edison's Washington Street Substation and heads east along Hartford Avenue for a distance of approximately 1,300 feet to the intersection with South Columbus Avenue. The route continues north along South Columbus Avenue, for approximately 100 feet to the intersection with Beechwood Avenue. At Beechwood Avenue, the route turns east and continues for a distance of approximately 1,300 feet to the intersection of Bradford Road. At Bradford Road the route travels northeast for approximately 200 feet and passes underneath the New Haven Line of the Metro-North Railroad and enters Wilson Woods Park. The route continues northeast through the park along Wilson Woods Park Road for approximately 2,200 feet. Before the intersection of Lincoln Avenue, the route turns east, crossing the Hutchinson River Parkway and Hutchinson River via directional drilling to a location near the intersection of Lincoln Avenue and First Avenue. The route then continues east along Lincoln Avenue for approximately 7,600 feet to the intersection with North Avenue. East of North Avenue, Lincoln Avenue becomes Manor Place. The route continues northeast through the North Avenue intersection onto Manor Place for approximately 500 feet to The Circle. The route travels south for approximately 350 feet along The Circle then intersects Manhattan Avenue. On Manhattan Avenue, the route turns northeast for approximately 575 feet and veers south onto vacant New York State Thruway Authority ("NYSTA") property, adjacent to the southbound exit lane of Interchange 16 of the New England Thruway (I-95). The route continues southeast for approximately 1,300 feet, crossing both southbound exit and entrance lanes of the Thruway and passes under the 8-lane New England Thruway overpass and under Metro-North's New Haven Line (which is also used by Amtrak between New Rochelle and New Haven) to the intersection of Commerce Street and Cedar Street, at which point the route turns south and continues along Commerce Street for approximately 125 feet to the gated driveway leading into the walled Cedar Street Substation.

## 2.2 Plan Organization

The major sections of the EM&CP are as follows:

- Site Preparation (Section 3.0);
- Clearing in Upland Areas (Section 4.0);
- Grading in Upland Areas (Section 5.0);
- Soil Erosion and Sediment Control (Section 6.0);
- Trenching (Section 7.0);
- Duct Bank Installation (Section 8.0);
- Water Body Crossing (Section 9.0);
- General Cleanup and Restoration (Section 10.0);
- Noise Impact Mitigation (Section 11.0);
- Transportation and Utility Crossings (Section 12.0),
- Hazardous Materials (Section 13.0);
- Right-of-Way Maintenance (Section 14.0); and
- Communications and Compliance (Section 15.0).

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# **3** SITE PREPARATION

## 3.1 Objectives

In order to minimize the adverse environmental impacts associated with site preparation to the extent practicable, staking and ROW delineation will be conducted prior to construction to identify the nature and impacts of the site preparation activities that include vegetation clearing, grubbing and terrain grading and leveling. Other than the site preparation activities associated with the installation of the 138 kV transmission line within the Cedar Street Substation and Washington Street Substation site boundaries, additional site preparation activities are not anticipated at the substations for the installation of the new equipment required to accommodate the feeder.

## 3.2 Staking and Right-of-Way Delineation

When staking out or delineating the right-of-way for construction the following steps will be taken:

- a. Duct bank centerline, right-of-way edges, and extra workspace boundaries will be surveyed and marked with stakes and colored flagging.
- b. In wooded areas, any clearing needed to facilitate surveying will be minimized as much as possible.
- c. To mark the limit of the construction right-of-way, flagging may be placed on trees or wooden stakes can be installed as needed along the outside edge of the work area. In addition, trees or shrubs selected for protection will be marked.
- d. Stakes and flagging will be spaced at appropriate intervals to ensure that unauthorized clearing and grading does not occur outside of the approved right-of-way boundaries. Flagging and/or staking will be checked before construction to ensure proper alignment.
- e. In populated areas, temporary construction fencing may be used to delineate the right-ofway. Fencing left in place during construction may also help restrict unauthorized access to the right-of-way.

# 4.1 Objectives

Where the transmission line traverses wooded terrain (e.g., adjacent to the Hutchinson River and the area between The Circle and the I-95 interchange), vegetation will be cleared to allow for grading and duct bank installation. Clearing operations will be guided by the following environmental objectives:

- a. Avoid and protect old growth, specimen and landscape trees;
- b. Minimize disturbance by restricting clearing to those areas necessary for construction and using equipment appropriate to site and timber conditions;
- c. Utilize timber resources; and
- d. Minimize impacts associated with forest disturbance and debris disposal.

## 4.2 Definitions

When discussing clearing operations and their impacts, the following definitions will be used:

<u>Timber/Logs</u> - trunks and limbs greater than 6 inches diameter at the small end, minimum 8-foot length.

<u>Slash</u> - shrubs, saplings, and tops of trees 4 inches diameter or less at the large end for hardwood; and 6 inches diameter or less at the large ends for softwoods.

<u>Stumps</u> - the woody stem and fibrous root mass left in the soil after removing the trunk at the butt.

<u>Clearing</u> - the cutting and physical removal, either by hand or mechanical means, of vegetation that would hinder transmission line construction.

<u>Grubbing</u> - the mechanical removal of the stump and root mass of felled woody vegetation.

## 4.3 Clearing Methods and Procedures

During clearing operations, construction crews, along with Con Edison personnel, will scout the terrain ahead for unexpected conditions, check right-of-way boundaries and review property-specific conditions or restrictions noted on drawings and line lists. Trees will be felled into the right-of-way and away from streambeds to avoid off-right-of-way damage, using some or all of the various methods and equipment as described below:

<u>Bladed Mowers</u> - Bladed mowers (i.e. "brush hogs") may be used on stands of smaller timber and brush. They will not be used where the timber may be utilized or stacked.

<u>Chainsaws</u> - Chainsaws may be used on trees of any size, particularly on larger timber where restricted access limits the use of mechanized equipment, (i.e. wetlands, stream buffers, and steep terrain). After limbing, logs will be handled as noted below.

## 4.4 Log Disposal

Trees are a valuable natural resource. Logs greater than 6-inches in diameter may be useful as firewood. Logs greater than 10-inches in diameter may be merchantable. Logs will either be removed off-right-of-way to an approved disposal area or chipped. If chipped, resulting wood chips will be hauled off-right-of-way to approved disposal sites or for other uses. Considering area aesthetics and traffic safety, log piles within the right-of-way will not be permitted for the Cedar Street Project.

#### 4.5 Slash and Stump Disposal

Slash will be chipped and the resulting wood chips will be hauled off-right-of-way to approved disposal sites or for other uses. Stumps and grubbed material will also be hauled off-right-of-way to approved disposal sites. Slash and stumps will not be piled or burned within the right-of-way.

#### 4.6 Vegetation Buffer Areas

A vegetation buffer is a portion of the right-of-way at stream crossings or visually sensitive locations where minimum construction disturbance and vegetation clearing is preferred. Vegetative buffers will be maintained where specified in a Commission Order or in the applicant's plan. To prevent soil erosion along streams, vegetation (ground cover, shrubs, and tree stumps) will be left in place within a minimum 15-foot strip on each bank until the time of crossing. Tree cutting will be limited to the use of chain-saws. Where vegetation grubbing and

initial grading is necessary for equipment crossing along the travel-way, erosion and sediment control structures will be installed, as detailed in Section 6 of this document.

To the extent practicable, existing vegetation will be maintained at selected road and stream crossings and at the periphery of visually sensitive locations such as historic sites. In addition, existing vegetation will be maintained in locations where complete right-of-way clearing is not needed, such as portions of the route where facilities will be installed via directional drilling or horizontal boring.

Buffer areas will be clearly marked on detailed construction drawings, indicated on line lists, and marked in the field to avoid accidental clearing. Additionally, the company's Chief Construction Inspector will notify clearing and other crews of buffer areas that will be encountered that day.

#### 4.7 Fences

The proposed right-of-way is located near fences serving as property boundaries and other purposes. Unless otherwise directed by the landowner, fences that are removed or damaged during construction will be restored or replaced during restoration.

Fences (wood, wire, mesh, etc.) will be dismantled and stored for re-use where practical. New fencing material will be used if the original is damaged. Fencing will be repaired or replaced to original standards or better in consultation with the landowner.

# 5 GRADING IN UPLAND LOCATIONS

#### 5.1 Objectives

Following vegetation clearing operations, the right-of-way or work areas for horizontal borings may be graded where needed to create a workable and safe surface for construction activities and equipment movement. Environmental objectives during grading include: conserving natural resources; (e.g. landscaping or residential topsoil); minimizing soil erosion and stream sedimentation; and confining construction disturbance to the approved right-of-way or work area limits. Other than the excavation activities associated with the installation of the 138 kV transmission line within the Cedar Street Substation and Washington Street Substation site boundaries, additional site preparation activities are not anticipated at the substations for the installation of the new equipment required to accommodate the feeder.

#### 5.2 Techniques and Equipment

Bulldozers, excavators, and loaders will be the prime equipment used for grading the right-ofway and work areas. Where unfavorable soil and moisture conditions are present, stabilization measures will be employed (e.g. topsoil stripping, geotextile fabric, gravel or stone fill, construction mats, drainage culverts, etc.). All erosion control and sedimentation control devices will be installed prior to the initiation of the grading activities as described in Section 6.

Grading activities will be confined within approved right-of-way and work area boundaries. During construction, at locations where special grading procedures require additional workspace, the company will obtain the necessary landowner and agency approvals for additional right-ofway prior to initiating work.

#### 5.3 Topsoil Stripping and Segregation

Wherever right-of-way construction requires the removal of topsoil for trench excavation, the topsoil will be removed from the site and disposed of with other excavated subsoil material. At the time of backfill, select fills shall be placed around and above the installed duct bank, compacted and stabilized to pre-existing conditions. Topsoil will be restored in accordance with original soil profiles generally not to exceed a maximum of 12 inches.

#### 5.4 Access Roads and the Construction Paths

#### 5.4.1 Objectives

To establish construction paths of sufficient size and in sufficient numbers to safely and efficiently move personnel and equipment to, from, and along the transmission line right-of-way, while minimizing impacts to resources.

#### 5.4.2 Construction Paths

The construction path (travelway) is a linear section of the right-of-way, parallel to the trench where equipment and vehicles may travel the length of the project or portions of it. For those areas of the Cedar Street Project where the transmission line right-of-way is not located within paved areas or roadways (i.e., the I-95 interchange), a construction path of not more than 20 feet in width will be established along one side of the trench. If unstable soil conditions are encountered at the time of construction, it will be necessary to modify the construction path to make it stable enough for safe use. The following modifications should be considered and applied, as appropriate:

a. stripping and storing topsoil;

b. placing crushed stone on the construction path;

c. placing geotextile fabric covered by clean fill in the path; or

d. using prefabricated wooden or metal construction mats.

#### 5.4.3 Off Right-of-Way Access Roads

Considering the location and accessibility of the transmission line right-of-way relative to existing public roadways, no off right-of-way access roads are planned for construction of the Cedar Street 138 kV transmission line.
# 6 SOIL EROSION AND SEDIMENT CONTROL

The following sections provide an overview of the soil erosion and sediment control measures that will be implemented during construction of the Cedar Street Project.

# 6.1 Topography and Site Soils

Topography along the route of the proposed transmission line is level to slightly sloping with elevations that range from approximately 50 feet above mean sea level ("MSL") to 100 feet MSL. Although several localized areas of sharp grade change are found in the vicinity of the Washington Street Substation, Wilson Woods Park, and the Hutchinson River, the flat to gently sloping topography along the transmission line route is ideally suited to the shallow subsurface excavation required to support the construction.

The proposed transmission project traverses the following soil series mapped in the USDA Soil Survey of Putnam and Westchester Counties, New York (USDA Soil Conservation Service, 1994): Urban Land; Charlton-Chatfield Complex; and Fluvaquents-Udifluvents Complex. Most of the proposed transmission line route crosses areas classified as Urban Land soils, which consist of areas where buildings, parking lots, or other impervious structures cover at least 60 percent of the surface. Along the proposed transmission line route, the Urban Land soils are associated with soils derived from glacial till, which includes the Charlton, Paxton, Woodbridge, and Ridgebury soil series. These soils are very deep, medium textured and moderately coarse-textured soils derived from gneiss, granite, or schist. These soils are too variable to provide any detailed characteristics with out site-specific investigations.

The Charlton-Chatfield complex soils are found in the area of Wilson Woods Park. This unit consists of the moderately to very deep and well-drained Chatfield soils and the well-drained Charlton soil. Slopes range from 2 to 15 percent. The depth to bedrock is considerably less with the Chatfield soil – 20 to 40 inches as compared to more than 60 inches with the Charlton soil. Rock outcrops are not uncommon in areas of this mapping unit.

The Fluvaquent-Udifluvents complex soils, found in the vicinity of the Hutchinson River, are formed in recent alluvial sediment. They are very deep soils that are well drained to very poorly drained. Their main characteristic is that they are subject to frequent flooding. Because they are associated with stream movement of alluvium, their characteristics vary widely.

# 6.2 Representative Construction Activities

The following construction activities will proceed in a series of overlapping phases: centerline staking and utility mark-out; pavement cutting and removal; trench excavation; duct bank and

manhole installation; trench backfill; and site restoration (i.e., paving and/or landscaping). Specific crossings of the Hutchinson River Parkway, Hutchinson River and I-95 exit ramp will be accomplished using horizontal boring/jacking techniques and will require the following: work area clearing and site preparation; jacking/receiving pit excavation; casing pipe installation; duct bank installation; backfill and site restoration. The BMPs for erosion and sediment control will be implemented early in the construction process and prior to the start of excavation activities. These include installation of stabilized construction entrances at locations where the right-of-way leaves paved areas and installation of erosion and sediment control measures (i.e., hay bale barriers and/or silt fencing). Procedures for protecting catch basins will be implemented on an as-needed basis.

#### 6.3 Plan Components

The following sections provide a description of the site stabilization, structural practices and best engineering practices to be implemented as part of the Soil Erosion and Sediment Control Plan.

#### 6.3.1 Site Stabilization

Erosion and sediment control measures will be implemented prior to initiating land disturbing activities and will not be removed until the disturbed land areas are finally stabilized. Appropriate measures for the Cedar Street Project include use of silt fences or straw bale sediment barriers. At the end of each workday and after storm events (i.e., ½ inch of rain or more in a 24-hour period), all erosion control devices will be inspected in each work area and repaired, as necessary, to ensure proper functioning. Additional stabilization measures that may be used during project construction include:

- **Protection of Trees/Mature Vegetation.** Natural mature vegetation will be preserved to the extent practicable. Where feasible, preserving natural and mature vegetation will provide an aesthetic buffer, preserve habitat, and reduce soil erosion. A vegetated strip will be maintained along the bank of the Hutchinson River to stabilize the bank and limit erosion and sedimentation.
- *Mulching*. Mulching is the placement of material, including but not limited to hay, grass, woodchips, straw, and gravel, on the soil surface to cover and hold in place disturbed soils.

Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have permanently or temporarily ceased, but in no case more than 6 days after the construction activity in that portion of the site has stopped.

All proposed best management practices shall be designed and maintained in accordance with the New York Guidelines for Urban Erosion and Sediment Control (Soil and Water Conservation Society, 1997) and the Westchester County Best Management Practices for Erosion and Sediment Control (Westchester County, 1991).

#### 6.3.2 Structural Practices

Structural controls are used to divert storm water runoff flows away from disturbed areas, or otherwise limit the discharge of sediment from exposed areas of the site to the degree attainable. For the transmission line right-of-way and work areas, appropriate structural controls include the following:

- Stabilized construction entrances;
- Silt fence and straw bale sediment barriers; and
- Drainage and diversion devices.

Descriptions of the structural control measures that will be used are as follow:

Stabilized Construction Entrance. A stabilized construction entrance consisting of crushed stone over geotextile fabric will be established where the construction right-of-way leaves the roadway or paved area. These areas include the work areas associated with the horizontal borings for the Hutchinson River Parkway, Hutchinson River, and I-95. The stabilized construction entrances will limit the potential for off-site tracking of soil by construction vehicles.

*Silt Fence.* Silt fences are used as a temporary measure and consist of posts with filter fabric. The fence is installed along the down slope or side slope of a disturbed area. Runoff passes through the openings in the fabric, while sediment is trapped and settles on the uphill side. Silt fences will be placed, as appropriate, along perimeter areas that drain away from disturbed surfaces. Construction details for the silt fencing are shown on Drawing No. 351844-00.

Straw Bales. Straw bales act as a temporary measure similar to a silt fence. If required, straw bales shall be tightly packed in a linear or crenellated fashion, and each bale shall be secured with two stakes. Bales with broken strings or wires shall be replaced. Straw (hay) bales can be used interchangeably with silt fences. Construction details for the straw bale sediment barriers are shown on Drawing No. 351844-00.

Sediment Retention Basins and Filtration Devices. These structures and devices will be installed to filter sediment-laden water when dewatering open excavations (i.e., trenches and jacking/receiving pits). Retention basins can be constructed of hay bales, filter fabric, or other materials. As an alternative, dewatering effluent can be pumped through filter bags, which can be

bought commercially. Once filtered and/or settled, clear water would be pumped or allowed to flow onto a vegetated area or discharged into nearby storm sewers. Trapped sediment will be disposed of along with excavated material or graded into the right-of-way or work area without being washed into the adjacent stream, wetland, or other sensitive resource.

These structural control measures will remain in place throughout the construction effort until final restoration and/or landscaping has been established. Routine inspections will be undertaken to ensure that their integrity is maintained.

#### 6.3.3 Other Best Management Practices

In addition to the erosion and sediment controls discussed above, other practices shall be undertaken to reduce potential pollution in storm water runoff. The additional controls to protect the quality of storm water runoff from the construction zone include:

- Dust suppression practices;
- Proper handling of excavated materials;
- Proper storing and handling materials on-site;
- Proper disposing of sanitary waste;
- Proper disposing of solid waste;
- Proper handling and manifesting any hazardous waste generated on-site; and
- Implementing spill prevention and control measures.

*Dust Suppression.* Dust from construction activities will be controlled through periodic wetting of exposed soils and roadways. Dust mitigation using fine water sprays will be performed on an as-needed basis depending on observed site conditions and the location and type of activities being performed. Chemical dust suppressants will not be used.

**Proper Handling of Excavated Materials**. Excavated material removed from the trench will be placed directly into dump trucks and removed to an approved disposal location. Excavated material will not be stockpiled along the right-of-way or at off-site locations for reuse as backfill. Road base material and select backfill material will be imported from off-site on an "as-needed" basis.

The site contractor(s) selected by Con Edison to construct the transmission line will be required to observe the excavation activities to determine the potential for contaminated soils. The contractor will determine the potential for contaminated soils through indicators such as presence of free product, stained soils, oil or chemical odors, and/or utilizing photoionization air monitoring equipment such as a organic vapor meter (OVM) or flame ionization devices such as the organic vapor analyzer (OVA). If it is determined by the contractor that contaminated soils

may be present, the contractor will be required to stop all excavation activities and notify Con Edison Environmental Health and Safety representatives who will coordinate soil testing. In accordance with standard Con Edison procedures, the soil samples obtained would be analyzed for polychlorinated biphenyls (PCBs) and total petroleum hydrocarbons (TPH). Additionally, toxic characteristic leaching procedure (TCLP) testing (minus TCLP herbicides and TCLP pesticides) will be conducted. Should the results of the testing determine that contaminated soils are in fact present, the contaminated soils excavated would be disposed of by a licensed contractor at a facility licensed to accept such material in accordance with applicable laws.

**Proper Material Handling Practices.** Construction materials will be stored in a manner that minimizes exposure to precipitation and runoff, where appropriate, or otherwise to prevent the contamination of storm water. For materials that must be kept dry (fertilizers, plaster, dry ingredients, etc.), indoor storage, temporary shelters, storage trailers, tarpaulins, and other means will be employed to keep these materials from being exposed to storm water. Building component materials that are normally allowed to be exposed to precipitation while being stored will be placed in upland areas away from all storm water conveyances. They will be stored in a manner that will not concentrate runoff.

Sanitary Wastes. A licensed sanitary waste management contractor, as required by local regulations, will collect all sanitary waste from on-site portable units.

Solid Waste. Con Edison will implement a solid waste management program for the Cedar Street Project. Recycling will be encouraged and supported through the on-site placement of appropriate containers. Solid waste and debris that cannot be recycled, reused or salvaged, will be stored in on-site containers for off-site disposal.

*Hazardous Waste.* Con Edison will implement a hazardous waste management program for the Cedar Street Project. Any hazardous wastes will be separated from normal waste through segregation of storage areas and proper labeling of containers. Any hazardous waste will be removed from the construction area by licensed contractors in accordance with applicable regulatory requirements and disposed of at an approved/licensed facility. The following steps are to be taken with respect to hazardous wastes:

- Con Edison will ensure that hazardous waste transporters servicing the Project have all required licenses, registrations and/or USEPA identification number prior to releasing hazardous wastes.
- Con Edison will follow accurate record-keeping requirements as to the quantity and nature of hazardous wastes generated onsite, and will maintain a file of Material Safety Data Sheets (MSDS) for all on-site chemicals.

- All hazardous waste will be transported under a cradle-to-grave system of manifests.
- Appropriate storage and transportation containers will be used, along with secondary containment measures where applicable.

*Spill Prevention and Control Measures.* The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff during the construction period.

- All material stored on-site will be stored in a neat, orderly manner in appropriate containers with appropriate labels.
- Products will be kept in their original containers with the original manufacturer's label, unless the containers are not re-sealable.
- Original labels and Material Safety Data Sheets will be retained for the period of time that the product is being utilized onsite in accordance with all applicable Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1926.33).
- Manufacturer's recommendations for proper use and disposal will be followed.
- Petroleum and hydraulic fluid: All on-site construction vehicles including contractor employee vehicles that are parked on the right-of-way will be monitored for leaks and will receive regular preventative maintenance to reduce the risk of leakage. Petroleum products and hydraulic fluids that are not in vehicles will be stored in tightly sealed containers that are clearly labeled. Equipment fueling will be conducted with extreme care, under continual surveillance and away from conveyance channels. Drip pans will be used and a supply of absorbent pads will be maintained on hand and utilized, as required. In the unlikely event of a release, all spills will be promptly cleaned up.

#### 6.4 Inspection Requirements

At the end of each workday and after storm events (i.e., <sup>1</sup>/<sub>2</sub> inch of rain or more in a 24-hour period), all erosion control devices will be inspected in each work area and repaired, as necessary, to ensure proper functioning. Additional inspections are to be periodically performed on all disturbed areas that have not been finally stabilized, on areas used for storage of materials that are exposed to precipitation, on structural control measures and on vehicle entrances/exits. For areas that have undergone final stabilization or where runoff is unlikely due to winter

conditions, inspections are to be performed at least once every month by the Construction Contractor.

Material storage areas and disturbed areas will be inspected for evidence of, or the potential for, pollutants entering the drainage system. Vehicle construction entrances and exits will be inspected for evidence of off-site sediment tracking.

Based on results of the inspections, the EM&CP shall, within 14 calendar days, be modified as necessary to correct problems identified. Modification or installation of additional BMPs shall be completed before the next anticipated storm event, if practicable, or otherwise as soon as practicable.

Inspection reports will be prepared for each inspection performed and retained as part of this EM&CP. Appendix B provides a copy of a representative Inspection Checklist Report/Maintenance Report Record. Each inspection report will provide the name(s), title(s) and qualifications of the personnel conducting the inspection, date(s) of the inspection and major observations of the inspection relating to the implementation of the EM&CP. Observations will include the following:

- Locations of sediment or other pollutant discharges;
- Locations of BMPs requiring maintenance;
- Locations of BMPs failing to operate adequately or as designed;
- Locations where additional BMPs are required; and
- Descriptions of activities conducted in contravention to this EM&CP or otherwise contributing to storm water pollution.

The inspection report will either certify compliance with this EM&CP or identify any incidents of non-compliance. For incidents of noncompliance, the inspection report will also describe the modifications to the Project or control measures to be implemented to prevent further incidents of non-compliance. The inspection reports will be signed by an authorized individual and retained for a period of three years following the date the right-of-way is finally stabilized.

# 6.5 Maintenance Requirements

The following maintenance procedures are to be performed as noted.

• Litter, construction debris, and chemicals shall be prevented from exposure to storm water and from becoming a pollutant source. A daily walkover of the construction site to identify exposure of potential pollutants to storm water shall be performed.

- All structural control measures receiving flows from areas that have not been permanently stabilized shall be inspected at the end of each workday.
- Built-up sediment shall be removed from silt fences and graded into the right-of-way or disposed of off-site when it has reached half of the aboveground height of the silt fence.
- Sediment shall be removed where accumulations reach one-third the above-ground height of any straw bale barriers and graded into the right-of-way or disposed of off-site.
- Silt fences will be inspected for depth of sediment, tears or sags in the fabric, and to see if the fabric is securely attached to the posts. Posts will also be inspected to ensure that they are firmly set in the ground.
- Hay/straw bale dikes shall be replaced when the strings have broken. Two stakes shall be maintained in every bale. Firm contact shall be maintained between adjacent bales and between the bales and the ground.
- Deteriorated silt fences shall be replaced as soon as the condition is discovered.
- Vehicle tire cleaning devices shall be maintained to ensure their proper operation.

# 6.6 Record Keeping

Records regarding storm water pollution prevention activities shall be maintained at the construction field office and retained by Con Edison for a period of three years. Records to be retained shall include:

- The EM&CP and all revisions
- All inspection reports.

# 6.7 Revisions to the EM&CP

The EM&CP will be amended whenever:

- There is a change in design, construction, operation or maintenance which will have a significant effect on the potential for the discharge of pollutants to the Waters of the State of New York;
- The EM&CP proves to be ineffective in eliminating or significantly minimizing pollutants in storm water runoff; or

• The EM&CP is proven to be ineffective in achieving the general objectives of controlling pollutants from the construction site's storm water system.

### 6.8 Operations Stormwater Management

In locations where the transmission line is not located beneath paved roadways, the corridor shall be vegetated, which effectively minimizes and controls stormwater runoff from the right-of-way during operations. Refer to Section 14 for a description of the right-of-way maintenance schedule for operations.

The operations of the Cedar Street Substation will require modification of the existing SPDES Permit No. NY 0267805. The existing storm water management practices located at the Cedar Street Substation include, but are not limited to, the use of a oil/water separator unit to treat the industrial storm water (i.e., storm water collected in the two transformer containment areas and industrial yard drains) and a series of catch basins and storm drains that lead to the municipal 24inch storm sewer system that ultimately discharges to the Long Island Sound. Because the new transformer and containment structure will be located on an existing foundation, an increase in impervious surfaces or an increase in storm water runoff is not anticipated at the Cedar Street Substation. Con Edison proposes to discharge the new containment unit to the existing oil/water separator. The existing oil/water separator, with a hydraulic loading of 3,000 gallons per minute, has adequate capacity to handle the additional storm water loading generated by the new (approximately 2,000 square foot) containment unit as well as oil released as a result of a catastrophic transformer failure.

The BMPs to be implemented on-site for operations at the Cedar Street Substation include, but are not limited to, the following:

- Maintenance of existing level grades;
- Minimization of impervious surfaces by locating the new transformer and containment unit on an existing foundation;
- Integration of the new third transformer with the existing oil-water separator to capture any oils that could potentially leak from any of the sealed transformers within the substation; and
- Maintenance of the existing site drainage system to convey all storm water runoff to the local storm sewer through catch basins and storm drains.

There shall be no change to the current storm water drainage patterns, storm water runoff rates, and storm water quality at the Washington Street Substation with the installation of the proposed

improvements. Therefore, no additional storm water controls are proposed for the Washington Street Substation during operations. Con Edison shall continue to perform the required maintenance activities on the existing site drainage system to ensure proper operations in accordance with the local and state requirements.

Con Edison shall inspect all storm water controls at the substations on a routine basis to ensure that the controls are operating effectively. Storm water controls that are identified for maintenance shall be repaired before the next anticipated storm event, if practicable, or otherwise as soon as practicable. Inspection reports shall be prepared for each inspection performed and retained by Con Edison for a period of three years.

# 7 TRENCHING

# 7.1 Objectives

To maintain a safe and stable trench, minimize erosion, and provide suitable access across the trench where needed. Con Edison will take all necessary precautions for protection of work and safety of the public during trenching activities such as the use of barricades, danger signals, fencing, traffic cones, flag men, warning signs, etc. All barricades, danger signals, fencing, warning signs and obstructions will be adequately illuminated at night (sunset to sunrise).

# 7.2 Trenching Equipment

Trenching will be performed by rubber-tired or tracked backhoe, excavator, or other type of ditching machine. The type and size of the equipment depends upon such criteria as duct bank configuration, trench width, soil conditions, and topography. Suitable precautions and safeguards will be used in operating the heavy equipment so pavement adjacent to trench areas is not damaged. Proper pumping equipment will also be available to properly dewater all excavated trenches, openings and existing structures to prevent flooding of adjacent properties.

# 7.3 Trench Width and Cover Requirements

All trenches and opening will be made by open cut from the surface. The trench width at the bottom will be sufficient to ensure safe installation of the duct bank and allow for padding and backfill to appropriate specifications. The trench wall will be tapered outward at an angle appropriate to soil type, moisture, and trench depth, in conformance with OSHA requirements (29 CFR 1910 et al.). Excavations five feet or more in depth or where a danger of slides or cavein exist as a result of excavation shall be shored, sheeted, braced or sloped to the angle of repose. In addition, sides of trenches in unstable or soft material shall be shored, sheeted, braced, sloped or otherwise supported by means of sufficient strength to protect employees working within them. Generally, 3 to 5 feet of cover above the duct bank will be provided along most of the route of the Cedar Street Project. At least 5 feet of cover will be provided where the duct bank is located beneath the Hutchinson River Parkway and associated ramps, which are under NYSDOT jurisdiction, and at the exit ramp from 1-95, which is under NYSTA jurisdiction.

# 7.4 Length of Open Trench

To minimize the potential for erosion and slumping of the open trench and traffic and land use impacts, efforts will be made to limit both distance and duration between trenching and duct bank installation. Limits will depend on duct bank configuration, construction method, soils, topography, land use, weather and erosion control measures.

Generally, only 1,000 to 1,500 feet of open trench will be allowed at any given time at any one location. However, site-specific conditions may warrant leaving the trench open for greater distances as long as equipment, construction fencing and crossings are in place and that all necessary in-trench erosion control devices have been installed and maintained.

### 7.5 Blasting

Generally, Con Edison does not use blasting when trenching within public streets. In locations where shallow bedrock cannot be excavated or chemically, hydraulically or pneumatically fractured, explosives may be used to break the rock into removable pieces. Blasting activities will conform to all applicable local and federal laws and regulations, including:

- a. 27 CFR 55, (OSHA);
- b. 29 CFR 1910.109, 1926.900 and 1926.914, (OSHA);
- c. The U.S. Bureau of Mines Guidelines; and
- d. NYCDEP Guidelines for An Acceptable Blasting Plan.

In the event that blasting is required, experienced and qualified personnel will design and perform all blasting activities in accordance with an approved blasting plan. The plan, if required, will be prepared by a seismologist with recognized credentials and will be provided to the DPS staff by Con Edison. In addition to statutory compliance, the following practices will be followed.

# 7.5.1 Pre-construction Studies

Where field surveys and soils data indicate the likelihood of shallow bedrock, geologic testing shall be performed to determine those areas likely to require blasting. In these areas, the distance to sensitive receptors (e.g., residences, historic structures, wells/springs, utilities) will be determined. Resources at risk will receive pre-blast baseline tests (e.g., water well location, quality and flow, structural and wall conditions including foundation condition, wall cracks). Copies of any pre-construction study reports as well as the blasting plan will be provided to the DPS staff prior to blasting.

# 7.5.2 Monitoring and Inspection

Blasting supervisors (shooters) will be licensed by New York State. A copy of the shooter's license(s) will be supplied to DPS staff before blasting operations begin. The company will employ an independent blasting consultant to monitor compliance with regulations, conduct

vibration and water well testing and investigate damage claims. The consultant will have the authority to halt blasting operations when standards are not met.

#### 7.5.3 Time Constraints and Notification

- a. Explosive use will be limited to the hours of 9:00 a.m. to dark on non-holiday weekdays, unless otherwise approved by DPS staff;
- b. To control flyrock or other airborne debris, rubber tire or woven steel blasting mats will be used, unless otherwise approved by DPS staff;
- c. DPS staff and local and state public safety officials will be notified at least 48 hours before blasting is initiated on a project, and each morning with planned blasting locations; and
- d. Inhabitants of occupied structures and businesses within <sup>1</sup>/<sub>4</sub> mile of the centerline will be notified at least 48 hours before blasting in that area.

#### 7.5.4 Remediation

Con Edison will compensate landowners for the reasonable costs of, or repair of, any documented damage to property, structural foundation and wall damage, and reductions in water well quality and quantity, etc., resulting from blasting operations.



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# MANHOLE AND DUCT BANK INSTALLATION

# 8.1 Manhole Installation

The manholes will be set prior to the ductwork. Prior to starting excavation for a manhole, a diagonal test pit will be dug by hand from corner to corner and full depth of proposed installation plus one foot to expose all subsurface utilities.

Where possible, the manholes will be prefabricated and set by a crane into a shored excavation. Once the excavation is complete, i.e. shored and level, the manhole vendor will truck the manhole on site to be lifted and placed. Once in and level, the casting frames and covers will be placed followed by waterproofing using a Con Edison standard bitumastic seal over the entire top of the manhole. Once dry, the sheeting can be pulled and the backfill of the excavation can proceed. Typically, for a standard site, the excavation will require one day followed by placement first thing in the morning. The grade will be restored before the end of the day although the contractor may leave the end walls open for later duct installation. The open excavation will be secured by construction fencing. Manhole installations within streets and sidewalks and field construction of manholes could require a week or more, depending on site conditions.

#### 8.2 Duct Bank Installation

The conduit material shall be fiberglass-reinforced epoxy (FRE). Prior to installation, the installing party will make an inspection of the general conduit condition, whether it is company forces or contractor personnel. The inspection will include a random check of sections with a mandrel.

An overview of the duct bank installation procedures is provided below:

- a. **Excavate Trench:** The trench will be excavated to provide a minimum of 3 feet of cover over the envelope. See Section 7.3 for a more detailed description of the trench width and cover requirements.
- b. Lay Conduit: The conduits will be laid in the trench using an intermediate spacer as a cap over each top conduit to prevent it from floating during placement of the concrete. The conduit separators will be installed at 5-foot centers.
- c. **Pour Concrete**: The concrete will be placed directly against the trench walls if they are vertical and stable. If forms for the monolithic duct bank are required, the duct bank will be constructed of plywood, planking, or other suitable material adequately braced to contain the

fluid pressure of the wet concrete. Any necessary forming that is required will be removed before backfilling. After the concrete has been placed to the specified height, the bracing will be removed to prevent conduit flotation and any voids will be filled with mortar. If heavy rains occur at any time during the concrete operations, plastic sheets will be placed over the fresh concrete.

Concrete that is placed in cold weather will be protected from freezing by placing roofing paper on top of the concrete envelope and then backfilling with 12-inches of clean sand. The sand will be placed with care to avoid damaging the concrete envelope and conduits.

Concrete truck wash-out, if conducted, will be directed into the excavated trench, under no circumstances will truck wash-out be discharged onto the ground surface or storm sewers.

- d. Place Backfill: Backfill will be placed on the concrete duct bank once the initial set has taken place. No traffic loads will be allowed directly over the trench for at least 12 hours after installation. If traffic plates are used to open the area to vehicles, a void between the plate and the top of the backfill will be installed so that the wheel loads are carried by the sides of the trench and not the duct bank.
- e. Duct Rodding: A duct rodding device will be passed through the completed conduit to check for continuity and cleanliness. Following the duct rodding device, a mandrel, of a size not less than ½-inch smaller than the diameter of the conduit, will be pulled through the conduit once in each direction. The mandrel will be preceded by a wire brush tied to the same rope. No conduit will be regarded as acceptable unless free passage in both directions is obtained of the duct rodding device and mandrel.

If difficulty is encountered in passage of the duct rodding device or the mandrel, a series of wire brushes will be drawn through the conduit, once in each direction, using a trailing line to remove any soil or debris that might have entered the duct since it was installed. The brushing operation will continue to the extent necessary to ensure free passage of the mandrel. All brushing will be performed in the direction of the cable pull. The wire brushes will be 1/8-inch diameter less than the diameter of the conduit. If the correct size cannot be passed through on the initial attempt, the operation must be repeated using smaller brushes until accomplished as specified.

f. Water Jetting (if necessary): When accumulations of soil and debris are such that the rodding device cannot pass from one structure to another, a water jetting operation will be employed. A source of pressurized water is connected to a hose line that terminates in a nozzle assembly. This nozzle is fed into the conduit to the point of the obstruction by means of a rod or snake. The water supply is then turned on and allowed to impact upon the

blockage and wash the accumulated debris away. Water that accumulates in the manhole structure as a result of water jetting will be pumped into a frac tank and hauled to an approved disposal center. Once the debris has been removed or softened, the rodding device or snake can be passed through and the conduit cleaned in the normal manner. If it is not deemed feasible to accomplish this operation, the conduit will be exposed and repaired. Any method used to clean the conduit will be accomplished in a manner that will not damage the smooth bore. Any damaged conduit will be replaced with new conduit.

Once the duct is found acceptable, a line will be attached to the rodding device or approved mandrel and passed through the conduit to establish that a specific size passageway exists from one end of the duct to the other and establish that the alignment of the duct is such that the horizontal and vertical bends meet the specified minimum radii requirements. The line should be long enough to allow pulling in of sufficient 1/2-inch polypropelene rope, or equivalent, behind the mandrel so that 6-inches of rope will extend beyond the conduit ends. This rope will be made fast in each of the manholes in a manner that shall not be in contact with any cables or bonds in either manhole. No duct rope will be left in the conduits for an indefinite period of time.

# 8.3 Cable Delivery, Installation, and Splicing

Cable installation will begin after several sections of the manhole and duct system are complete and will consist of duct preparation and cable pulling. The duct must be checked for obstructions a day or two before the planned pull. This will require a mandrel and wire brush be pulled from one manhole to another by truck-mounted winches. Also the day before the planned pull, the cable reels will be unwrapped and loaded by crane onto the forty-foot long transportation trailer. Two reels will be loaded for the typical two pulls planned per day. Reel storage will be a locally rented lot or possibly at the substations. On the day of the pull, the reel will be positioned using a crane at one manhole while the winch truck will be positioned at the pulling manhole. A pull for one leg of cable requires approximately six hours to set up, pull cable and break down. Each manhole will require from three to six cable pulls. Depending upon municipal requirements, cable pulling operations may be performed at night.

Once two adjacent sections of cable have been installed, cable splicing can begin. Splicing at each manhole will require approximately one week of around the clock operation. During this time, a splicing trailer and several work trucks will be parked over each manhole to provide ventilation, light and power to the manhole. Electrical services will be run from the nearest overhead distribution to provide power. Portable generators will be required where no overhead supply lines exist such as within Wilson Woods Park or at the NYS Thruway.

During this time appropriate traffic control cones and signage will be required, consistent with Con Edison's Work Area Protection and Traffic Control Field Manual, which is attached as Appendix E.

# 9 WATER BODY CROSSINGS

#### 9.1 Objective

To plan and install construction paths, access roads, and transmission line waterbody crossings in ways that minimizes adverse impacts to aquatic life and water resources to the maximum extent practicable.

#### 9.2 Hutchinson River Crossing

The Hutchinson River is the only waterbody crossed by the Cedar Street Project. At the crossing location in the vicinity of Lincoln Avenue, the Hutchinson River is considered a "minor water body," with a DEC classification of "B." Horizontal boring is the preferred crossing method planned by Con Edison at this location. DPS staff will be provided with a detailed plan of the construction activity and a schedule for the Hutchinson River crossing prior to the start of construction. In the event that the anticipated crossing date is changed, DPS staff will be provided at least 48 hours notice to that effect.

### 9.3 Horizontal Boring Procedures

To install the Cedar Street feeder under the Hutchinson River, Con Edison plans to utilize the conventional Horizontal Boring method to bore beneath the river. The primary objective of this method is to avoid any disturbance to the surface waters and riverbed of the Hutchinson River. A single bored crossing for the Hutchinson River and the adjacent Hutchinson River Parkway for the new circuit is planned at this location. Movement of construction vehicles and associated equipment across the river will be via the existing Lincoln Avenue bridge at this location. Vehicles or other equipment will not operate or cross within the streambed. A minimum of 5 feet of cover will be provided between the 42-inch steel casing and the bottom of the riverbed. The plan and profile for this crossing is shown on Drawing No. 348713; additional design details are shown on Drawing No. 351847.

The length of this bored crossing would be approximately 166 feet. Staging areas are necessary at each end of the crossing to establish the jacking and receiving pits and to set up and operate the boring equipment. Construction should proceed as follows:

- a. NYSDOT and owners/operators of other underground utilities in the area will be notified a minimum of 48 hours prior to the start of construction.
- b. All existing underground facilities will be marked prior to the initiation of boring.

- c. All materials needed to complete the installation will be on site prior to the start of boring.
- d. Boring and receiving pits adjacent to the Hutchinson River Parkway and 1<sup>st</sup> Avenue will be clearly identified and barricaded to prevent them from being a hazard to pedestrian or vehicular traffic. In accordance with the Maintenance and Protection of Traffic Plan, temporary concrete barriers will be placed longitudinally along the curb in the vicinity of the boring and receiving pits. The pits will be constructed with minimum 12-inch by 2-inch planks that will extend at least four feet above grade; the "door" to the pit will be orange construction netting.
- e. Boring and receiving pits will be fenced and marked if left open overnight.
- f. Roadside boring and receiving pits shall be backfilled for a distance of at least 15 feet from the travel portion of the road within one week of the facility installation, unless conditions or circumstances warrant a different period as determined by the Engineer Inspector, Chief Construction Inspector, or DPS Staff inspectors.

#### 9.4 Spill Prevention

The following procedures and precautions will be implemented to ensure that the Hutchinson River is protected from accidental spills and uncontrolled releases of hazardous materials and fuel:

- a. All employees and/or other handlers of hazardous materials will be properly trained and instructed on the proper reporting and handling requirements;
- b. All equipment will be maintained in good operating condition and inspected on a regular basis;
- c. Refueling may occur within the work zone adjacent to the Hutchinson River, but only after notification is made to the Area Environmental Inspector and proper precautions are taken to prevent spills;
- d. Hazardous materials will not be stored within the work zone adjacent to the Hutchinson River. This applies to storage and does not apply to normal operation or use of equipment in these areas;

e. All equipment operating within the work zone adjacent to the Hutchinson River will have sufficient spill containment equipment on board to provide for prompt cleanup in the event of a release;

#### 9.5 Buffer Areas

A vegetation buffer area will be maintained at the Hutchinson River. Vegetation in the buffer area will include small trees (generally up to 20 feet in height), stumps, shrubs, and herbaceous plants. The buffer area should be a minimum of 15 feet long and extend the entire width of the work zone.

# 10 GENERAL CLEANUP AND RESTORATION

Vegetation restoration for the construction areas located outside of paved areas will include preparation of the soil for subsequent plantings, application of topsoil on unpaved areas, and the provision and application of grass, shrubs and trees in accordance with local guidelines and right-of-way requirements. The Construction Contractor will maintain lawns and plantings for specified time periods and will replace unsuccessful plantings. Con Edison will survey vegetation restorations and identify vegetation areas and plantings that are not satisfactory. Vegetation plantings will be performed by a qualified nursery and supervised by Con Edison. Con Edison will notify the PSC within 10 days following completion of final restoration.

### 10.1 Cleanup and Disposal

Cleanup and disposal of vegetation will occur on a daily basis during trimming and construction clearing. Cleared vegetation will not be burned, buried or stockpiled and will be removed at the end of each workday. Cleared vegetation will be disposed of by chipping and hauling, or by chipping and spreading in appropriate areas designated by the Construction Manager.

All debris resulting from demolition, clearing, grubbing or stripping will be disposed of at an approved construction debris disposal area in compliance with all appropriate environmental regulations. Trucks leaving the construction area will be loaded, trimmed and covered in accordance with appropriate regulations. Prior to construction, Con Edison will obtain the locations of proposed disposal sites from the Construction Contractor and provide this information to the DPS staff.

#### 10.2 Vegetation

Vegetation restoration will consist of replacement of damaged and removed trees, shrubs and ground cover along with soil stabilization and placement of appropriate topsoil. In those areas that are under the jurisdiction of NYSDOT and the NYSTA, landscape restoration will be coordinated with the appropriate parties. Furnishing and placement of vegetation and topsoil are discussed in the following sections.

# 10.2.1 Soil Stabilization, Aeration, and Fertilization

In unpaved areas, topsoil will be applied to an appropriate depth to cover all areas where vegetation plantings will be re-established. When appropriate, the Construction Contractor will scarify or till the subsoil surface to permit bonding of the topsoil and subsoil. Excess soils may

be removed from site, although excess topsoil may be used in other areas of the site where it is needed.

To permit maximum vegetative reproduction and growth, the topsoil will be cultivated to a depth of six inches by a mechanical tiller, with special care taken around trees to avoid root damage. If a mechanical tiller cannot be used, then the inaccessible areas will be cultivated by hand. Foreign materials and contaminated soils will not be used for topsoil. Following placement of topsoil, the area will be raked and large stones, rocks and weeds will be removed. The replaced soil will be properly graded to conform to the original contours and grade. The topsoil will be workable and applied under dry conditions, and will be either obtained from the immediate area or imported.

Soil compaction in construction areas frequently occurs as a result of the movement of heavy equipment over soil. This will be avoided to the extent possible. However, if compaction occurs, soils will be aerated. Aeration in grassy areas will be accomplished through use of a mechanical power aerator. Following use of the aerator, the area will be thoroughly raked. If soil is compacted below trees, then the area below the trees canopy will be aerated by probing holes in the soil, which will then be backfilled with clean sand.

Fertilizer will be applied to all areas receiving vegetation plantings. Planting strips and other areas where grasses will be planted will receive fertilizer. Fertilizer rates will be dependent on tree size and fertilizer type. Fertilizer over grassy areas will be evenly broadcast and cultivated or watered into the soil. Fertilizer application for trees will be distributed manually or with approved hydro-pressure equipment in holes 18 inches deep below the tree canopy. Fertilizer will be applied under the direction and supervision of the Construction Manager.

#### 10.2.2 Mulching

Mulch will be applied to areas that will be seeded in erosion prone locations and can also be used to protect areas brought to final grade at an unfavorable time for seeding or plant transplanting. The areas can then be planted when the time is appropriate without removing the mulch. Mulch will also be applied to the immediate vicinity of replacement plants to encourage the downward movement of surface water. Mulching will reduce loss of soil moisture by evaporation and will decrease the possibility of seedling damage from soil heaving caused by freezing and thawing.

Mulch will be spread uniformly in a continuous blanket of sufficient thickness. The mulch may be spread by hand or machine. Mulch may be spread before or not later than three days after planting. Anchorage such as jute mesh will be used as required.

For standard hay mulching, the Construction Contractor will provide clean weed-free, salt-free hay or threshed straw of wheat, rye, oats or barley. When used after seeding, mulch will be applied at a rate of 4,000 pounds per acre.

#### 10.2.3 Vegetation Plantings

Grass and groundcover plants will be planted along the transmission line right-of-way in all disturbed, unpaved areas. Landscaping will reflect applicable local standards or guidelines. In addition, to the maximum extent possible, trees, shrubs, grass and groundcover plants inadvertently removed, damaged, or killed as a result of construction activity will be replaced. An assessment of damage to trees and shrubs will be conducted one growing season following construction to record latent damage. Con Edison will determine construction-related damage, with consideration given to the condition of the vegetation at the time of construction.

Con Edison will identify all trees, shrubs and groundcover plants necessary for replacement and will supervise the plant replacement. Trees and shrubs that had branches removed for construction will be pruned, shaped and fertilized for one season following the construction effort. Further pruning or shaping will be done using good horticultural practices and only at the direction of Con Edison.

Replacement trees, shrubs and other groundcover plants will be of the same species as those damaged or removed whenever possible. The American Standard for Nursery Stock (ANSI Z60.1-1986) will provide the necessary standards for plant replacement. Trees, shrubs and other plants for replacement that are less than or equal to four inches diameter breast height (dbh) will be replaced by approximately the same size plant at the same location. Trees that are greater than four-inch dbh will be replaced with a sufficient number of trees to equal or exceed the total dbh of removed trees. If adequate root space is not available in the area of replacement trees, the trees may be planted within <sup>1</sup>/<sub>4</sub> mile of the project area as determined by Con Edison after consultation with landowners or local officials.

Plants which fail to meet specifications as described by the American Standard for Nursery Stock will be rejected. All plants will be properly protected from damage or drying during transport between the nursery and time of planting.

The Construction Manager will direct the Construction Contractor, who will furnish, plant, dig, transplant, fertilize and replace all plant material. Tree and shrub planting methods will follow New York State Department of Transportation standard planting specifications.

#### 10.2.4 Groundcover Restoration

Grass areas that are damaged will be seeded under supervision of the Construction Manager. Grass seed will be of fresh, clean certified crop seed. Seeding method may be either broadcast or drill seed. After sowing the seed, the area will be lightly raked or dragged and then rolled. After the raking and rolling operations are completed, the entire seeded area will be watered with a fine spray until a uniform moisture depth of one inch has been obtained. Mulching and anchoring the mulch may be necessary in some areas. Fertilizer will be added appropriately after seed is applied.

Restored areas should have 90 percent permanent ground cover one growing season following construction. Seeded areas will be evaluated and reseeded as necessary to achieve 90 percent cover at the optimum time or by the following growing season.

#### 10.2.5 Planting Time Periods

For optimum growth and success, deciduous plants will be planted from approximately March to May and/or from approximately October to December. Evergreen plants may be planted from approximately April to May and/or from approximately September to October. No planting shall be conducted in frozen topsoil or when the soil is in an unsatisfactory working condition as determined by Con Edison's Engineer Inspector.

If grassy areas are approved for seeding, then seeding will be conducted during optimal time periods which are approximately between April and May for spring seeding and approximately August and September for fall seeding. Seeding will not be permitted during high winds or when the ground surface is too wet or too dry for proper working.

#### 10.2.6 Plant Inspection, Guarantee and Maintenance

The Construction Manager will inspect plants in containers prior to planting and will inspect plant locations to verify compliance with local guidelines and requirements. The Construction Manager will also conduct an inspection after completion of planting and a final inspection at the end of the maintenance period to ensure that previous deficiencies have been corrected.

All plants will be guaranteed for one year or for the duration of one full growing season, beginning after the last planting is complete, whichever is longer. At the end of the guarantee period, any dead, unhealthy or badly impaired plants shall be replaced. All replacement plants will be of the same species and size.

Maintenance of all tree, shrub and herbaceous vegetation will consist of a thorough inspection of all species one year following planting (end of second growing season). All dead trees and shrubs will be replaced with individuals of the same species during the planting period specified. Grass areas will be surveyed to determine degree of success. Unsuccessful, thin and bare patches will be replanted with seed of the same species mix and quality.

# 11 NOISE IMPACT MITIGATION

# 11.1 Objectives

To control and reduce noise impacts associated with transmission line construction and operation as much as practicable. Transmission line construction involves many activities that can produce localized increases in the noise levels. Noise generated by general right-of-way clearing and construction is transitory and short-term in nature. Noise impacts resulting from horizontal boring operations are stationary and have longer duration, thereby having the greater potential to result in noise impacts. Accordingly, special attention is therefore given to sensitive receptors in the vicinity of proposed horizontal boring activities.

### 11.2 Noise Sensitive Receptors

Horizontal boring will occur at two locations along the corridor; the Hutchinson River Parkway crossing and the New England Thruway crossing. Noise sensitive receptors at these locations include residences (single family homes and apartment buildings). These receptors range in distances of from 50 feet to 150 feet from the proposed horizontal boring locations. The nearest identified school is the Hutchinson Elementary School, approximately 400 feet away from the crossing of the Hutchinson River Parkway.

Traffic along the Hutchinson River Parkway and the New England Thruway contributes to expected high ambient noise levels during daytime hours.

#### 11.3 Mitigation and Control

There are several methods of reducing or controlling construction-related noise. Their applicability and effectiveness will vary with the size of the equipment used, the topography crossed and the nature of the receptor.

# 11.3.1 Noise Control Measures for Equipment and Linear Construction

- a. Locate equipment yards and marshalling areas away from noise sensitive receptors as possible and practical.
- b. Install improved or "hospital" grade mufflers on all heavy equipment used in noise sensitive areas (particularly on cranes and other equipment which may idle for extended periods).

- c. Restrict high noise producing activities, identified below, to the hours between 7:00 a.m. and 8:00 p.m. Monday through Friday and 9:00 a.m. to 6:00 p.m. on Saturday. Such activities are not allowed on any Sunday or recognized state or national holiday. These activities include:
  - Rock drilling for blasting operations;
  - Use of pneumatic hammers for ditching in bedrock areas;
  - Blasting operations, pile driving, the installation of sheet piles, sheeting or shoring;
  - Clearing operations, wood chipping machinery; and
  - Conventional boring operations.
- d. Restrict heavy equipment operation within 300 feet of a noise sensitive receptor to after 7:30 a.m. on weekdays and 9:00 a.m. on weekends.

#### 11.3.2 Noise Control Measures for Point Source Producers

Horizontal boring equipment can generate sound levels of up to 85 dBA at 50 feet. This equipment typically operates continuously during a work shift. Even with the presence of the major highways and likely elevated ambient sound levels, the proximity of noise sensitive receptors requires that mitigation measures, in addition to those provided for linear construction, be utilized. Practical noise mitigation for this type of activity, which is only anticipated to last several days, is limited to the installation of temporary noise barriers. The barriers could be constructed of plywood, and should consist of at least two sides to shield the nearest residences to the boring equipment. Recommended barrier density is at least two to four pounds per square feet. The recommended temporary noise barrier should provide a reduction of between 10 and 15 dBA."

# 12 TRANSPORTATION AND UTILITY CROSSINGS

### 12.1 Objective

Underground transmission line construction may have adverse impacts on roads, highways, railroads and other existing utilities. The objective of this section is to encourage and facilitate cooperative construction and maintenance practices and schedules between transmission line builders and those responsible for the other infrastructure. The project must not become a hazard to vehicular, pedestrian or rail traffic.

### 12.2 Road and Highway Crossings

#### 12.2.1 Permitting

The Cedar Street transmission line will make extensive use of existing roadway rights-of-way under the jurisdiction of the City of Mount Vernon, the City of New Rochelle, Westchester County, the New York State Department of Transportation (NYSDOT) and the New York State Thruway Authority (NYSTA). Con Edison has consulted with the appropriate state and county officials and will be obtaining required NYSDOT and NYSTA permits. Copies of the permits and approvals will be provided to DPS staff prior to construction in the areas subject to those permits. Table 12-1 and 12-2 provide a list of all affected roadways, the corresponding jurisdiction, and points of contact at each jurisdictional agency.

#### 12.2.2 Pre-construction Planning

Underground utilities that will be crossed or paralleled by the proposed transmission line have been identified and are shown on the Plan and Profile drawings that accompany this EM&CP. In selected areas, test pits will be excavated to precisely identify the location and depth of existing underground utilities. Owners of these other utilities will be notified in accordance with the requirements of 16 NYCRR Part 753 so that all underground utilities are located and clearly marked in the field prior to the start of construction.

Con Edison has developed a *Work Area Protection and Traffic Control Field Manual* to address those measures necessary to maintain traffic and provide a safe construction zone for those areas where construction activities will be within the roadway and/or the roadway right-of-way. This *Field Manual* complies with the 2003 *Manual on Uniform Traffic Control Devises*, published by the Federal Highway Administration and addresses temporary signage, lane closures, placement of temporary barriers and traffic diversion. A copy of Con Edison's *Field Manual* is included as Appendix E of this EM&CP.

Roadway	Jurisdiction
Hartford Avenue	City of Mount Vernon
South Columbus Avenue (NYS Route 22)	City of Mount Vernon
Beechwood Avenue	City of Mount Vernon
Bradford Road	City of Mount Vernon
Wilson Woods Park Road	Westchester County Department of Parks
Hutchinson River Parkway (Crossing)	NYSDOT
1 <sup>st</sup> Avenue	Town of Pelham
Lincoln Avenue	Westchester County Department of Public Works
(Between NYS Route 22 and New Rochelle)	
Lincoln Avenue	City of New Rochelle
(Between Village of Pelham and North Avenue)	
Manor Place	City of New Rochelle
The Circle	City of New Rochelle
Cedar Street	NYSTA
New England Thruway/I-95 (Crossing)	NYSTA
Commerce Drive	City of New Rochelle

# Table 12-1: Affected Roadways and Jurisdiction

Jurisdictional Agency	Contact (Name and Address)
City of Mount Vernon	Mr. Jim Finch
	Commissioner, Dept. of Public Works,
	1 Roosevelt Sq, - Room 108
	Mount Vernon, NY 10550
	914-665-2334
City of New Rochelle	Mr. Jeffrey C. Coleman, P.E.
	Commissioner
	Department of Public Works
	City Hall, 515 North Ave.
	New Rochelle, NY 10801
	(914) 654-2136
	Jcoleman@ci.new-Rochelle.ny.us
Town of Pelham	Mr. Richard Slingerland
	Village Manager, Village of Pelham
	195 Sparks Avenue
	Pelham, NY 10803-1829
	(914) 738-2015
	richard.slingerland@villageofpelham.com
Westchester County Department of Parks	Joseph A. Stout, Commissioner
	Westchester County Department of Parks
	25 Moore Avenue
	Mt. Kisco, NY 10549
	(914) 864-7075
Westchester County Department of Public	Mr. Kevin Roseman
Works	Westchester County Dept. of Public Works
	148 Martine Avenue
	White Plains, NY 10601-3378
	(914) 995-4084
	kmr5@westchestergov.com
NYSDOT	Mr. Brad Shilling
	Permit Engineer, Westchester South
	New York State Department of Transportation
	Saw Mill River Road (Route 9A & Dana Rd.)
	Valhalla, NY 10595
	(914) 592-1589
NYSTA	Mr. Daren Scalzo
	Division Permit Coordinator
	New York State Thruway Authority
	Suite 400,
	4 Executive Boulevard, Suffern, NY 10901.
	845-918-2510

# Table 12-2: Jurisdictional Agencies and Contacts



# 12.2.3 Road Crossing Methods

Two basic road crossing methods will be used for construction of the Cedar Street transmission lines: trenched ("open cut") and trenchless ("horizontal boring"). Road crossings of the Hutchinson River Parkway and the exit ramp of the New England Thruway (Interstate 95) are shown on the plan and profile drawings that accompany this EM&CP. The following procedures will be implemented at each of the road crossings:

# Trenched or Open Cut

- a. Owners/operators of other underground utilities in the area will be notified no less than 48 hours prior to the start of construction.
- b. All existing underground facilities will be marked prior to the initiation of cutting or excavation.
- c. All materials needed to complete the installation shall be on site prior to starting cutting or excavation.
- d. Tree limbs, shrubs, cobble stones or any other natural or man-made features that are at risk of damage will be temporarily moved, tied back or removed and stored.
- e. Detours, signage and public notice shall be implemented at least five days prior to the start of construction.
- f. Traffic flow will be maintained in at least one lane of the road at all times, or a detour will be provided. Flagmen or temporary traffic lights will be used where necessary to control traffic flow.
- g. Any water control devices (roadside ditches, culverts, etc.) disturbed during excavation or construction will be restored immediately after the trench is backfilled.
- h. Temporary restoration of the roadway will occur immediately after the trench is backfilled.

# <u>Horizontal Boring</u>

Conventional horizontal boring will be used at the exit ramp to the New England Thruway, the on/off ramp of the south bound Hutchinson River Parkway, and the crossing of the Hutchinson River Parkway and the Hutchinson River to install the duct bank without disturbing the road

surface. Traffic flow and patterns will be maintained throughout the boring operations and duct bank installation. Construction should proceed as follows:

- a. Owners/operators of other underground utilities in the area will be notified a minimum of 48 hours prior to the start of construction.
- b. All existing underground facilities will be marked prior to the initiation of boring.
- c. All materials needed to complete the installation will be on site prior to the start of boring.
- d. Boring and receiving pits adjacent to the road shoulder will be clearly identified and barricaded to prevent them from being a hazard to pedestrian or vehicular traffic. In accordance with the Maintenance and Protection of Traffic Plan, temporary concrete barriers will be placed longitudinally along the curb in the vicinity of the boring and receiving pits. The pits will be constructed with minimum 12-inch by 2-inch planks that will extend at least four feet above grade; the "door" to the pit will be orange construction netting.
- e. Boring and receiving pits will be fenced and marked if left open overnight.
- f. Roadside boring and receiving pits shall be backfilled for a distance of at least 15 feet from the travel portion of the road within one week of the facility installation, unless conditions or circumstances warrant a different period as determined by the Engineer Inspector, Chief Construction Inspector, or DPS Staff inspectors.

# 12.2.4 Longitudinal Highway Occupation

Along much of the proposed routes, the transmission lines will be installed longitudinally in or adjacent to roadways, including Hartford Avenue, South Columbus Avenue, Beechwood Avenue, Bradford Road, Wilson Woods Park Road, 1<sup>st</sup> Avenue, Lincoln Avenue, Manor Place, The Circle, Cedar Street, and Commerce Drive. Facilities proposed to be located longitudinally in NYSDOT and NYSTA highway right-of-way are subject to Parts 131 and 133 of the state highway law. Construction will proceed as follows:

- a. Owners/operators of other underground utilities in the area will be notified a minimum of 48 hours prior to the start of construction.
- b. All existing underground facilities will be marked prior to the initiation of cutting or excavation.

- c. Tree limbs, shrubs, cobble stones or any other natural or man-made features that are at risk of damage will be temporarily moved, tied back or removed and stored.
- d. Detours, signage and public notice will be implemented at least five days prior to the start of construction.
- e. Con Edison will reduce the amount of open trench at the end of the workday to the minimum practicable.
- f. All areas of open trench unable to be plated will be barricaded and lit with warning lights prior to the end of the workday.
- g. Driveways and drainage ditches will be temporarily restored at the end of each workday.
- h. Access to driveways will be maintained to the maximum extent practicable.
- i. Temporary patch of asphalt road cuts will begin immediately after backfill.
- j. Temporary patch of major road damage (i.e., ruts, potholes, grade loss, etc.) will begin immediately after backfill.

# 12.2.5 Signs

All signs utilized will comply with the NYSDOT Manual of Uniform Traffic Control Devices (Manual No. 7155). Placement of signs will be determined in consultation with the jurisdictional agency. At a minimum, signs will be placed at the following distances:

a. Signs announcing construction at 500 feet and 1,000 feet.

- b. Signs picturing workers at 300 feet.
- c. Blast warning signs at 1,000 feet if blasting is to take place within 50 feet of the road.

Flagmen will be present at all times when equipment is crossing any road, when equipment is being loaded or unloaded and where two lane traffic has been reduced to one lane. All flagging operations shall comply with 17 NYCRR 131.

# 12.2.6 Repairs and Restoration

Restoration of any road surface will follow the sequence outlined below.

- a. Road shoulders (maximum 15 feet) will be returned to original grade immediately following backfill.
- b. Placement of a temporary road surface will take place immediately after backfill in accordance with state or municipal standards or permit requirements.
- c. Permanent repair of asphalt roads will take place as soon as practicable, but in any event within six months of backfill. All temporary pavement, broken pieces of pavement, or other materials with which trenches and openings have been temporarily surfaced or backfilled with will be removed and disposed.
- d. Permanent repair of other road damage will take place during final restoration.
- e. Permanent repair of dirt and gravel roads (ruts, potholes and loss of grade) will take place during final restoration.

# 12.3 Utility Crossings

Special precautions, as detailed below, will be taken where the new transmission facilities cross or parallel existing utilities to prevent damage to either facility and to ensure the safety of workers.

#### 12.3.1 Overhead Electric Facilities

When crossing an existing overhead electric line right-of-way the following specifications will apply:

- a. The utility responsible for the up-keep and maintenance of the overhead electric line will be contacted and consulted concerning the proposed crossing.
- b. The responsible utility will be consulted concerning "safe minimum clearance" for construction machinery.
- c. All guy wires, ground lines and other surface or subsurface supports or facilities will be located prior to the initiation of construction.

d. Depending on the length of the facility to be installed, the voltage of the electric line to be crossed and existing weather and topography, the new facility and the construction equipment installing it may need to be temporarily grounded. This activity will be performed in compliance with the National Electrical Safety Code (NESC) as applicable to electric transmission line construction.

### 12.3.2 Underground Utility Crossings

When installing an underground electric transmission line in close proximity to other underground utilities (i.e., Y-49) the applicant will refer to 16 NYCRR Section 255.3-25. In addition, the following specifications will apply:

- a. The proposed project area will be surveyed for the presence of existing underground utilities to be crossed or paralleled.
- b. Owners of these other utilities will be notified in accordance with the requirements of 16 NYCRR Part 753 so that their facilities will be clearly marked prior to construction.
- c. Owners of the facilities crossed will be contacted no later than 24 hours prior to the start of construction and will be given reasonable opportunity to be present during excavation and construction.

# 13 HAZARDOUS MATERIALS

Under the New York State Navigation Law, the person responsible for the discharge of petroleum must report the incident to the DEC within two hours of discovery. The law defines a discharge as any intentional or unintentional action resulting in the spill, release, pumping, etc., of petroleum to a waterway or to the lands from which it might flow into the waterways.

For spills of chemicals, other than petroleum, the New York State Hazardous Substance regulations (6 NYCRR Part 595) apply. In these regulations, a "release" is defined as "any unauthorized pumping, pouring, emitting, emptying, overfilling, spilling, leaking, leaching, or disposing, directly or indirectly, of a hazardous substance or any other substance which results in the formation of a hazardous substance upon release so that the substance or any related constituent thereof, or any degradation product of such a substance or of a related constituent thereof, may enter the environment." Under these regulations, a "spill" is defined as "any escape of a substance from the containers employed in the normal course of storage, transfer, processing, or use."

Con Edison's policy requires compliance with all federal, state and local laws, regulations and regulatory agreements pertaining to immediate and follow-up reporting of environmental spills or releases of petroleum products or hazardous substances. Con Edison has a Central Information Group (CIG) that makes all required agency notifications for releases of petroleum products and hazardous substances in addition to an Environment, Health & Safety (EH&S) Emergency Response Team (ERT) that receives regular training on federal, state and local release reporting laws. When CIG is notified of a release of a petroleum product or hazardous substance at a particular site, the ERT advises CIG on what agency notifications, if any, are required.

CIG is responsible for all reporting and documentation procedures required under the Oil Pollution Prevention Regulations (40 CFR Part 112) and pursuant to the guidance in the Determination of Reportable Quantities for Hazardous Substances regulations (40 CFR 117) and Designation, Reportable Quantities and Notification regulations (40 CFR Part 302).

#### 13.1 On-Site Reporting Requirements

This section provides an overview of the Con Edison Corporate Environmental Procedure for Release Reporting (CEP 10.01) and General Environmental Instruction Spill Response and Cleanup (GEI 2.01). A complete copy of the referenced corporate procedures will be kept onsite by the Environmental Inspector or Chief Construction Inspector (EI/CCI) and will be used in the event of a spill. To fulfill Con Edison's release reporting obligations, CIG and ERT need prompt, accurate and complete information for spills or releases occurring at the site. Therefore, all spills on-site should immediately be reported to the EI/CCI. The EI/CCI will be responsible for obtaining all relevant spill information needed to complete the Spill Information Checklist. The EI/CCI will call all spills into the local Con Edison spill reporting desk at (914) 925-6219, who will review the Internal Reporting Matrix for Spill Notification to determine if the spill should be reported to CIG. If the local Con Edison spill reporting desk determines that the spill meets the internal reporting requirements, he/or she will immediately contact CIG using the established environmental hotline number of (212) 684-2030. Depending on the nature and severity of the event, the EI/CCI, the Area Environmental Specialist or the ERT will immediately mobilize the appropriate response personnel in accordance with Con Edison's Standard Operating Procedure (SOP) for Spill Response and Clean Up.

The EI/CCI will be responsible for reviewing and modifying this plan, as necessary, within 14 calendar days of knowledge of the release to provide a description of the release, an account of the circumstances leading to the release, and the date of the release. In addition, the plan will be reviewed by the EI/CCI to identify measures to prevent the recurrence of such releases and to provide better response to such releases in the future.

# 13.2 Off-Site Reporting Requirements

CIG is responsible for making all contacts to the local, state and federal agencies relative to a reportable spill. Con Edison has prepared a comprehensive SOP that includes a very detailed notification/reporting procedure to be used by the ERT to determine whether a spill is reportable. This section provides an overview of the local, state and federal notification and reporting requirements and regulatory triggers that are incorporated into the Con Edison SOP.

Within two hours of discovery of a reportable discharge, the Company will notify DEC by telephoning the DEC hotline at 1-800-457-7362, and the Westchester County Department of Health by telephoning (914) 813-5000. As indicated previously, the EI/CCI will follow the Company reporting chain to ensure that CIG is contacted and the appropriate spill information is relayed to them. It is then the responsibility of the ERT to determine if a reportable release/spill has occurred at the site and to instruct CIG as to the appropriate agency contacts.

CIG will initiate the contact to the appropriate agencies when a release of a reportable quantity of a hazardous substance exists, or, if any of the following conditions exist for a release of a lesser quantity of a hazardous substance:

• Such release results, or may reasonably be expected to result, in a fire with potential offsite impacts;
- Such release causes, or may reasonably be expected to cause, an explosion,
- Such release causes, or may reasonably be expected to cause, a contravention of air quality standards;
- Such release results, or may reasonably be expected to result, in vapors, dust and/or gases that may cause illness or injury to persons, not including persons in a building at the facility where a release originates; or
- Runoff from fire control or dilution waters may cause or contribute to a contravention of water quality standards.

When reporting a spill, CIG shall provide all of the following information to the DEC and the Westchester County Department of Health, when available:

- Name of the person making such report and his/her relationship (agent, employee, etc.) to any person (corporation, company, etc.) which might be responsible for causing such discharge;
- Time and date of the discharge;
- Probable source of the discharge;
- Location of the discharge, both geographic and in relation to bodies of water;
- Type of petroleum or hazardous substance discharged;
- Possible health or fire hazards resulting from the discharge.
- Amount of petroleum or hazardous substance discharged;
- All actions that are being taken or will be taken to clean up and remove the discharge;
- Personnel presently on the scene; and
- Other government agencies that have been or will be notified.

When appropriate, CIG will contact the Westchester County local authorities (e.g., fire departments, police department, public works) as knowledge of a major spill or release becomes

available. Prompt reporting allows quick response, which may reduce any adverse impacts to human health and the environment.

## 14 RIGHT-OF-WAY MAINTENANCE

#### 14.1 Objectives

Measures will be taken to ensure the safe and environmentally compatible maintenance and operation of completed electric transmission facilities.

### 14.2 Right-of-Way Maintenance

After completion of cable pulling and splicing and site restoration, the construction of the project can be considered complete. Any further work on the facility should be considered as part of facility operation and maintenance. Since the Cedar Street Project 138 kV transmission line will be located within existing public roadways and utility easements, management of the right-of-way in these areas (i.e., vegetation maintenance and erosion control) will be the responsibility of the property owner in accordance with existing right-of-way maintenance. Accordingly, a Right-of-Way Management Plan is not warranted for this project.

#### 14.3 Inspection

All rights-of-way will be inspected one year after completion of restoration and periodically thereafter, as needed, to determine:

a. The condition of all permanent erosion control devices installed during construction; and

b. The stability of duct bank cover and adjacent revegetated right-of-way areas.

Any observed problems with any of the above features will be corrected as expeditiously as possible.

# 15 COMMUNICATIONS AND COMPLIANCE

Con Edison has developed an environmental compliance process for the Project that will be used in conjunction with its Environmental, Health & Safety (EH&S) Program to assure compliance with applicable environmental regulations during Project construction. Con Edison will have permits from various environmental regulatory agencies that allow construction of the Cedar Street Project facilities. Compliance with these permits requires that all construction sequences and engineering plans, as represented in the permit applications, be followed and that environmental measures be implemented and/or monitored routinely.

### 15.1 Responsibilities of the Engineer Inspector or Chief Constructor Inspector

Con Edison will be represented by an onsite Engineer Inspector or Chief Construction Inspector (EI/CCI), who will be onsite every day that construction activities are in progress. The primary responsibility of the EI/CCI is to ensure that all Project construction activities, environmental mitigation measures and operations are conducted in strict compliance with federal, state and local environmental health and safety regulations and standards, Con Edison procedures and protocols, and the Certificate conditions. The EI/CCI will have sufficient knowledge and experience to manage the environmental compliance process described in the Plan, including the conduct and oversight of inspections and audits. The EI/CCI will be onsite throughout the construction and restoration period. The EI/CCI will also be supported by the Area Environmental Specialist who will frequently visit the site to ensure the project is being conducted in accordance with all federal, state and local environmental health and safety regulations and protocols, and the Area Environmental Specialist who will frequently visit the site to ensure the project is being conducted in accordance with all federal, state and local environmental health and safety regulations and standards, Con Edison procedures and protocols, and the Article VII Certificate conditions.

### 15.2 Procedure for Issuing a Stop Work Order

The purpose of Con Edison's Corporate Safety Procedure 28.00 ("Time Out Program") is to ensure that all Con Edison employees have the right to issue a "Stop Work Order" without reprisal if they are unsure of how to proceed on a job because of a safety or environmental concern. Refer to Appendix C for a complete copy of Corporate Safety Procedure 28.00. The responsibility for ensuring that this takes place depends upon open communication between the contractor, subcontractors, and Con Edison employees and the EI/CCI. When a safety or environmental concern arises, the individual should immediately notify the EI/CCI and provide him (or her) with information regarding the nature of the concern. After the EI/CCI becomes aware of the concern, he or she will verbally inform the Con Edison Project Construction Manager (PCM) of the nature of the concern. The EI/CCI and/or PCM will then meet with the contractor's and/or subcontractor's employees to discuss and resolve the issues. In the event that the issue is not resolved, the EI/CCI has the authority to issue a verbal "Stop Work" Order (if necessary) for the subject operations to the Contractor's Project Manager. The EI/CCI shall enter a summary of such Stop Work Order discussions into the General Site Activities record. Once the order is issued, the Contractor's Project Manager shall direct his workers and all subcontractors affected by the Stop Work Order to stop work immediately. The EI/CCI, within 24 hours, shall provide a written Stop. Work Order to both the Contractor's Project Manager as well as Con Edison's PCM. The written Stop Work Order shall include an explanation of the issue of concern and a summary of relevant discussions, the date and time of when the order was issued and the date and time that construction was stopped and/or should stop.

The EI/CCI shall ensure that any and all written Stop Work Order(s) shall be hand delivered to the Contractor's Project Manager and/or Site Supervisor. If the Contractor's Project Manager or Site Supervisor is not available, then the order shall be issued to the next person in command. The EI/CCI shall not issue a Stop Work Order directly to any of the Contractor's employees or its subcontractors under any circumstance with the exception as follows:

If the activity poses an *immediate threat to life and/or safety or the contractor is* carrying out activities in a manner that is reckless, dangerous or in a noncompliant manner, then the EI/CCI may issue a Stop Work Order, either verbally or in writing, directly to the Contractor's employees or its subcontractors. The EI/CCI shall issue the Order to the onsite representative responsible for overseeing such activities, or next in command if direct supervisor is not available, and may call upon necessary support, including but not limited to regulatory agency or Police support to stop the operations immediately.

Once a Stop Work Order has been issued, the activities in question cannot be resumed without the EI/CCI first receiving and approving a written statement from the Contractor indicating that the activity(ies) in question have been satisfactorily addressed and that ongoing construction activities will be carried out in compliance with all applicable federal, State and local statutes, ordinances, rules and regulations. In addition, the EI/CCI will meet with the PCM, the Contractor's Project Manager, and any additional relevant party to discuss the non-compliance and to implement guidelines to avoid such non-compliance in the future.

#### 15.3 Deployment of More than One Environmental Inspector

If applicable construction activities are being carried out in two or more locations at the site, and if deemed necessary by the EI/CCI, then provisions will be made for deployment of sufficient inspectors for these events. The EI/CCI shall be responsible for the coordination of the number

of activities taking place at any given time such that an appropriate number of inspectors will be deployed onsite. The EI/CCI will be responsible for collecting daily reports from any additional inspectors onsite, incorporating their reports into the records and reporting how many additional inspectors are onsite and the activities that each has been assigned to observe.

### 15.4 Inspection Compliance Checklist(s)

A Daily Inspection Report (DIR) and Compliance Audit Checklist will be developed to assist the EI/CCI and inspectors assigned to the Project. Appendix D provides a copy of a representative DIR and Compliance Audit Checklist. The preliminary audit checklist has been prepared to assist the EI/CCI in documenting that ongoing tasks/activities associated with the construction of the Cedar Street Project are being performed in a safe, timely manner and that compliance with regulatory permits/approvals/certificates is being monitored and/or tracked.

Completed DIRs will be kept on file by the EI/CCI. DIRs containing corrective actions will be reviewed with the PCM for timely resolution. Corrective actions performed will be summarized in the Monthly Environmental Audit reports described below.

### 15.5 Inspection Deficiency Response Procedure

As a matter of policy, Con Edison will maintain copies of each inspection report that will be logged in and recorded in a Master Log maintained by the EI/CCI. For each inspection report, the EI/CCI will record his/her name and the date of inspection; the nature of the inspection (i.e., daily; weekly; monthly; visual; testing); the subject area of inspection; and whether the results of the inspection indicate no problems or satisfactory inspection; whether suggested actions and recommendations should be investigated; and whether the inspection revealed non-compliance. Copies of any inspection reports that require corrective actions to be taken on the part of the Contractor will be given to them.

For those inspection reports identifying serious non-compliance that results in a "Stop Work Order," the Contractor and/or Con Edison will follow the procedure referenced above.

For those inspection reports revealing non-compliance that do not pose imminent environmental harm or safety hazard, the Contractor and/or Con Edison will assess the information presented in the inspection report within 24 hours of receipt of the inspection report. On each report, the Contractor and/or Con Edison will note the corrective action(s) taken or to be taken to address the comments and/or non-compliance notations on the inspection report.

On a weekly basis, the EI/CCI will present a report to the PCM as to the status of all outstanding items/tasks identified through the inspection items/tasks identified through the Inspection Reports and the status of the corrective action steps, if any, to satisfactorily address each item/task.

## 15.6 Monthly Environmental Audits

The Area Environmental Specialist will perform an environmental audit of the site within the first week of every month during construction. The audit will involve both a visual site reconnaissance/walkover of the entire construction site as well as a review of the various compliance plans, inspection reports, etc. The Area Environmental Specialist will prepare a written report documenting his/her findings by the 10<sup>th</sup> day of each month and include a copy of the audit checklist completed by the Area Environmental Specialist or designated inspectors during the audit. This report will be submitted to the Contractor and the Con Edison PCM at that time. By the 25<sup>th</sup> day of the month, the Contractor and Con Edison PCM will have reviewed the monthly audit findings and prepared a written report that addresses each aspect, including corrective actions taken, if any, of the Area Environmental Specialist's monthly audit report. The Con Edison PCM shall submit this completed report to the DPS staff.

## 15.7 Environmental Management Controls

## 15.7.1 Permits/Approvals

In addition to the Certificate, Con Edison is responsible for obtaining additional environmental permits, approvals, easements and rights-of-way in order to construct the Cedar Street Project transmission and substation facilities. Pre-construction related approvals include:

- NYSDOT and NYSTA Easement Agreements; and
- NYSDOT and NYSTA Utility Work Permits.

The EI/CCI and/or Contractor will retain copies of these documents onsite for reference.

## 15.7.2 Solid Waste Management

Con Edison and its subcontractors will comply with all required regulations governing the onsite management and off-site disposal of solid wastes (hazardous and non-hazardous) generated during construction of the Cedar Street Project. Prospective waste hauling/disposal contractors will be required to provide documentation to the EI/CCI showing they have all necessary permits/licenses in place prior to being awarded the work. In addition, Con Edison and its subcontractors will manage all petroleum products and chemical substances (termed "hazardous materials") in such a manner as to minimize the potential threats to human health and the environment.

### 15.7.3 Emergency Response

Con Edison is responsible for handling emergency situations such as employee accidents, fires and releases of hazardous substances stored at the Project site during construction. Fire safety inspections at the site will be conducted periodically through walkovers by the EI/CCI. These visual inspections will be primarily focused on housekeeping issues related to fire prevention. The EI/CCI will coordinate with local fire officials regarding onsite fire safety and emergency response.

Under the New York State Navigation Law, the person responsible for the discharge of petroleum must report the incident to the DEC within two hours of discovery. The law defines a discharge as any intentional or unintentional action resulting in the spill, release, pumping, etc., of petroleum to a waterway or to the lands from which it might flow into the waterways.

For spills of chemicals, other than petroleum, the New York State Hazardous Substance regulations (6 NYCRR Part 595) apply. In these regulations, a "release" is defined as "any unauthorized pumping, pouring, emitting, emptying, overfilling, spilling, leaking, leaching, or disposing, directly or indirectly, of a hazardous substance or any other substance which results in the formation of a hazardous substance upon release so that the substance or any related constituent thereof, or any degradation product of such a substance or of a related constituent thereof, may enter the environment." Under these regulations, a "spill" is defined as "any escape of a substance from the containers employed in the normal course of storage, transfer, processing, or use."

Con Edison's policy, as previously presented in Section 13, requires compliance with all federal, state and local laws, regulations and regulatory agreements pertaining to immediate and followup reporting of environmental spills or releases of petroleum products or hazardous substances.

# APPENDIX A

# CERTIFICATIONS

# OWNER WITH OPERATIONAL CONTROL OVER CONSTRUCTION PLANS AND **SPECIFICATIONS**

#### Consolidated Edison Company of New York, Inc. **Owner:**

#### **Responsibilities:**

Ensure that the Project's plans and specifications adequately address erosion and sediment control, and all other applicable conditions to prevent storm water pollution from construction activities.

Modify, as required, the plans and specifications for the Project and the CSWPP Plan/EM&CP. Identify the Construction Contractor with day-to-day operational control of the activities necessary to ensure compliance with the CSWPP Plan/EM&CP and other Article VII Certificate The Construction Contractor with day-to-day operational control over these Conditions. activities is:

#### **James Shannon** Name:

#### Certification:

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information presented. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information presented is, to the best of my knowledge and belief, true, accurate, and complete. This plan is fully supported by the management of Consolidated Edison Company of New York, Inc. and will be implemented as herein described. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

5/06 Project Manager

# CONSTRUCTION WITH DAY-TO-DAY OPERATIONAL CONTROL OVER CSWPP PLAN/EM&CP COMPLIANCE ACTIVITIES

Contractor: [To be determined]

#### **Responsibilities:**

Ensure that the CSWPP Plan/EM&CP for the Project site is implemented, maintained and updated, as appropriate, to address site conditions throughout the construction process.

Day-to-day operational control of the Project site, including the implementation, monitoring and maintenance of controls identified in the CSWPP Plan/EM&CP, except as otherwise noted in the plan.

### **Certification:**

I certify under penalty of law that I understand and agree to comply with the terms and conditions of the pollution prevention plan for the construction site identified in such plan as a condition of authorization to discharge storm water. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for storm water discharges for construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. This document and all attachments were reviewed under my direction or supervision in accordance with a system designed to assure that qualified personnel properly evaluated the information contained herein. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for reviewing the information, the materials contained in this document, to the best of my knowledge and belief, are true, accurate, and complete.

Signature

Date

Title

## APPENDIX B

# **REPRESENTATIVE INSPECTION CHECKLIST REPORTS/** MAINTENANCE REPORT RECORDS REPRESENTATIVE DAILY

# EXAMPLE

# **INSPECTION REPORT**

	Sneet 01
Project Name:	
File No	
Inspection Date:_	Time: Inspected by:
	STAGE OF CONSTRUCTION
Pre-Construc	ction Conference       Rough Grading       Finish Grading         Grubbing       Building Construction       Final Stabilization
	INSPECTION CHECKLIST
Yes No NA	
[] [] []	Have all denuded areas requiring temporary or permanent stabilization been stabilized? Seeded? yes/no Mulched? yes/no Graveled? yes/no
[] [] []	Are soil stock piles adequately stabilized with seeding and/or sediment trapping measures?
[] [] []	Does permanent vegetation provide adequate stabilization?
[] [] []	Have sediment trapping facilities been constructed as a first step in SESC?
[] [] []	For perimeter sediment trapping measures, are earthen structures stabilized?
[] [] []	Are sediment basins installed where needed?
[] [] []	Are finished cut and fill slopes adequately stabilized?
[] [] []	Are on-site channels and outlets adequately stabilized?
[] [] []	Do all operational storm sewer inlets have adequate inlet protection?

}

[] [] []	Are stormwater conveyance channels adequately stabilized with channel lining and/or outlet protection?	
[] [] []	Are utility trenches stabilized properly?	
[] [] []	Are soil and mud kept off public roadways at intersections with site access roads?	
[] [] []	Have all temporary control structures that are no longer needed been removed?	
	Have all control structure repairs and sediment removal been performed?	
[] [] []	Are properties and waterways downstream from development adequately protected from Erosion and sediment deposition due to increases in peak stormwater runoff?	
Comments:	·	
Verbal/Written	notification given to:	
Report by:	Date:	

•

# APPENDIX C

# CORPORATE SAFETY PROCEDURE 28.00 ("TIME OUT" PROGRAM)

## **CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.**

## CORPORATE SAFETY PROCEDURE

CSP 28.00 – Calling A Time Out Revision 2: 12/14/2005 Effective Date: 12/30/2005

### CONTENTS

SECTION 1.0 – PURPOSE SECTION 2.0 – APPLICABILITY SECTION 3.0 – INTRODUCTION SECTION 4.0 – COMPLIANCE REQUIREMENTS SECTION 5.0 – TIME OUT SAFETY TALK SECTION 6.0 – TIME OUT CARD SECTION 7.0 – DEFINITIONS

### 1.0 PURPOSE

The purpose of this procedure is to outline how a "Time Out" or work stoppage is called due to a safety, health and/or an environmental concern and how the "Time Out" is to be resolved prior to proceeding with work.

### 2.0 APPLICABILITY

This procedure applies to all Con Edison employees and contractors.

### 3.0 INTRODUCTION

Con Edison employees have the right to call a "Time Out" without reprisal if they are unsure of how to proceed on a job because of a safety, health, and/or environmental concern.

The Company's commitment to health, safety, and environmental excellence requires that all work proceed only after it is safe and environmentally sound. The responsibility for ensuring that this takes place rests with every employee. Effectively meeting these responsibilities depends upon open communication between individuals and their supervisors prior to work beginning, and – in certain cases – after safety, health and/or environmental issues are identified. All work shifts should begin with a safety talk in which all safety, health, and environmental issues should be discussed.

### 4.0 COMPLIANCE REQUIREMENTS

When a safety, health or environmental concern arises on a job, an employee has the right to call a "Time Out". Upon calling a "Time Out", the employee must immediately notify their supervisor and provide him/her with information regarding the nature of their safety, health or environmental concern and state that a "Time Out" is being called. When a "Time Out" is called, work stops. The "Time Out" applies only to the location where it has been called; there are no system-wide or company-wide "Time Outs."

The supervisor must contact or meet with the employee with the intent of resolving the employee's concerns. If the concerns are resolved to the satisfaction of the employee and the supervisor, and if there is certainty that all health, safety, and environmental procedures are being followed, the "Time Out" is over and work proceeds. If the concerns are not resolved to the satisfaction of the employee and/or the supervisor, work does not proceed, and the following process must be followed to resolve the concerns:

- The local EH&S representative is to be contacted to obtain assistance in resolving the concerns. The local EH&S representative will act as an authority (expert) related to, health, safety, and environmental rules, regulations and procedures, and attempt to make a determination. When necessary to resolve "Time Out" issues, the local EH&S representative may call upon subject matter experts from other areas of the Company as necessary, including, but not limited to, engineering, Corporate EH&S, the work rules committee and operations. If the local EHS representative understands all of the issues involved in the "Time Out," the local EHS representative's determination is final if deemed to be safe and the "Time Out" is over without consulting with the Subject Matter Expert. When necessary, company Subject Matter Experts shall serve as final arbiters of "Time Out" situations. In the event a "Time Out" reaches this level of review, the Subject Matter Expert's decision on the matter is final; the "Time Out" is considered concluded and, if there are no safety, health, or environmental issues, work proceeds. In either case, with the local EHS representative or the SME, the employees are expected to return to work as no safety, health, or environmental issue exists or it has been mitigated.
- In the event the local EH&S representative cannot be reached, the job is not to continue until EH&S intervention is obtained. The Corporate ERT can be used to either directly resolve the issue, or to obtain another EH&S representative who can. Further, any person listed on the "Time Out" card may be called to resolve the issue.
- In emergency and other situations where extensive job and procedural reviews are necessary to resolve the concerns, an alternate work plan, where practical, will be implemented to complete the job pending resolution of the "Time Out".

In this instance, before proceeding with any work prior to the resolution of this "Time Out", it is the responsibility of the Operating Supervisor and the local EH&S representative to ensure that the work will be performed in full accord with safety, health, and environmental procedures, that all rules and regulations are followed and that the work also satisfactorily minimizes safety, health, and environmental risks.

At the conclusion of all "Time Out" situations it must be clearly stated to all those involved that the "Time Out" is over.

When a "Time Out" has been called, and the employee and supervisor resolve the issue themselves and the work proceeds, the supervisor should notify the local EH&S representative if the "Time Out" was significant or could recur. In all "Time Out" situations, the EH&S representative will review the incident in a timely manner, determine if the "Time Out" has system-wide implications, and take steps as appropriate to prevent its recurrence.

CSP 28.00 - Calling A Time Out Page 2 of 3 Revision 2: 12/14/2005 Effective Date: 12/30/2005 Paper copies of procedures and instructions are uncontrolled and therefore may be outdated. Please consult Outlook Public Folders for the current version prior to use.

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### 5.0 TIME OUT SAFETY TALK

To ensure that all employees are familiar with and understand the Time Out Program, an annual safety talk should be conducted regarding the process and documented using Profile Number SAF 7240.

### 6.0 TIME OUT CARD

Each organization will issue a Time Out card to all of their employees. The card will be green and white, approximately 3-1/2 inches by 2 inches and will, as a minimum, be set up as follows:

SIDE 1	SIDE 2
You Can Always Call a Time Out	Operating Area Location
If you have a safety, health, and/or environmental question and/or concern, we are available 24 hours a day for assistance.	No job proceeds until it is made safe and environmentally sound
Con Edison Picture of "Referee"	List names and telephone numbers of local EH&S staff or
• •	Call the Control Center at (xxx) xxx-xxxx, to reach a Safety or Environmental Specialist to assist you

### 7.0 **DEFINITIONS**

CSP 28.00 - Calling A Time Out

Revision 2: 12/14/2005 Effective Date: 12/30/2005

Local EH&S Representative: The operating department's EH&S manager or one of his/her staff members.

**Operating Supervisor**: A supervisor in an operating department with that title or any other supervisor in another department.

Subject Matter Expert: An individual who has detailed, specific knowledge on a particular subject by the nature of his/her education, training and experience.

**Time Out:** Mechanism for any Company employee to stop a job if he or she is unsure of how to proceed because of a safety, health or environmental concern.

**Time Out Card**: Green and white card, approximately 3-1/2 inches by 2 inches, issued to all Company employees for the purpose of calling a Time Out.



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## APPENDIX D

# INSPECTION REPORT AND COMPLIANCE AUDIT CHECKLIST

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Con Edison	Date(s)	Page No. 1 of 4
Cedar Street Substation		Revision No. 0

The following preliminary compliance audit checklist is provided as a template for the Environmental Inspector(s) to document that ongoing tasks/activities associated with the construction of the facility are being performed in a safe, timely manner and that compliance with regulatory permits, approvals, and certificates is being monitored and/or tracked. This preliminary checklist needs to be revised over time to reflect actual stages of construction and/or facility operation. Compliance acceptability will be noted by the Environmental Inspector(s) in the corrective action/compliance documentation and/or comments column.

Compliance Location/Subject Area	Date	Inspected/Reviewed (Yes/No)	Corrective Action/ Compliance Documentation	Comments
<ul> <li>I. <u>General</u></li> <li>Are all required site plan drawings, reports, plans, etc., readily available and accessible at the site.</li> <li>Ensure that all commitments by Con Edison referenced in Article VII Application/Certificate; NYCDEP Permits; NYSDOT permits' and NYSDEC permit are complied with.</li> </ul>				
<ul> <li>II. <u>Site Safety</u></li> <li>Ensure that visiting contractors/vendors adhere to site safety requirements and parking locations.</li> <li>Ensure MSDS sheets updated and available at specified locations.</li> </ul>				
<ul> <li>Ensure regulatory agency representative(s) visiting site are escorted at all times by Construction Contractor and/or Con Edison representatives.</li> <li>Review Site Specific Environmental Health and Safety Plan for prepared by Construction Contractor is being implemented.</li> </ul>				

Con Edison	Date(s)	Page No. 2 of 4
Cedar Street Substation	· · · · · · · · · · · · · · · · · · ·	Revision No. 0

Compliance Location/Subject Area	Date	Inspected/Reviewed (Yes/No)	Corrective Action/ Compliance Documentation	Comments
<ul> <li>Verify Construction Contractor SPCC Plan prepared and implemented.</li> </ul>				
<ul> <li>Confirm that all construction workers are aware of and knowledgeable of Environmental, Health and Safety Plan.</li> <li>Ensure that Site Access, Safety and Construction Plans prepared for Work within County correctional facility are being implemented.</li> </ul>				
<ul> <li>III. <u>Water Supply/Stormwater Management</u></li> <li>Review EPC Contractor Water Management Plan and confirm proper implementation.</li> </ul>				
<ul><li>IV. <u>Soils Management</u></li><li>Verify Grading Plan is being implemented.</li></ul>				
<ul> <li>Verify Soil Erosion and Sediment Control Plan details properly implemented (e.g., hay bales located; gravel pads by roadways, etc.)</li> </ul>				
<ul> <li>V. <u>Hazardous Waste</u></li> <li>Confirmation that Con Edison and/or the Construction Contractor are knowledgeable of all hazardous chemicals handled, stored, etc., onsite.</li> <li>Verify that MSDS sheets are available at facility and that MSDSs have been submitted to state and/or local emergency planning committees as required</li> </ul>				

Con Edison	Date(s)	Page No. 3 of 4
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Compliance Location/Subject Area	Date	Inspected/Reviewed (Yes/No)	Corrective Action/ Compliance Documentation	Comments
<ul> <li>Confirm that Construction Contractor labels, tags or marks each container of hazardous chemicals.</li> </ul>				
<ul> <li>VI. <u>Transformers</u></li> <li>Confirm a SPCC Plan has been prepared and implemented prior to filling any transformers.</li> </ul>				
<ul> <li>VII. <u>Complaints</u></li> <li>Does a Complaint Log form/master logbook exist?</li> </ul>				
• Is Con Edison and/or the Construction Contractor documenting all complaints received and are they recorded in the master logbook?				
• Is Con Edison and/or the Construction Contractor regularly reviewing the complaint logbook and undertaking corrective actions, if necessary?				
<ul> <li>VIII. <u>Blasting Activities, if required</u></li> <li>Verify if construction activities require the use of blasting/explosives.</li> <li>If required, has Construction Contractor adhered to New York State Department of Labor requirements for the handling,</li> </ul>				

Con Edison	Date(s)	Page No. 4 of 4
Cedar Street Substation		Revision No. 0

Compliance Location/Subject Area	Date	Inspected/Reviewed (Yes/No)	Corrective Action/ Compliance Documentation	Comments
• Verify submittal and approval of a workplan to the NYCDEP Office of Water Supply Lands demonstrating that the blasting activities will be conducted in accordance with the NYCDEP Guidelines for an Acceptable Blasting Plan and local laws.				

## **APPENDIX E**

# WORK AREA PROTECTION AND TRAFFIC CONTROL FIELD MANUAL

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#### To All Con Edison Field Forces:

This is your field manual on Work Area Protection and Traffic Control. It is designed to help you achieve a safe work area, with limited obstruction to traffic, through the use of uniform traffic devices.

This edition of the manual has been updated to comply with the 2003 *Manual on Uniform Traffic Control Devices*, or MUTCD. The MUTCD is published by the Federal Highway Administration under 23 Code of Federal Regulations, Part 655, Subpart F. Traffic codes for the city of New York refer to the federal and state MUTCD codes. The state of New York, whose standards are similar to federal standards, has been mandated to conform substantially to the federal MUTCD by November 2005. This field manual is based upon three fundamental principles:

- protection for you and your coworkers while you work in the streets;
- protection for motorists and pedestrians;
- safe and expeditious movement of traffic around your work area.

Not all work sites, traffic, or pedestrian situations can be illustrated in this manual. Employees must apply the principles and tools covered in this manual to set up work area protection and traffic-control devices with all applicable traffic regulations in mind.



Because of the vital nature of our joins, we must gain access to areas where repair, maintenance, and construction are required. Providing a work area that is safe for everyone is of critical importance.

#### **Basic Principles of Work Area Protection**

Traffic conditions in our operating area make it necessary to plan protection for work areas in order to avoid vehicular and pedestrian traffic hazards and thus safeguard the public and our own employees.

The work area protection that you set up at the job site has two main goals:

- to provide suitable work area devices so that pedestrians and drivers of vehicles are aware of work area boundaries; and
- to provide bridging over excavations where pedestrian and vehicle traffic must be maintained during the job.

In addition, when planning work area setups, an important company concern is to maintain good relations with the public while maintaining safety in the work area. Employees in the field help create good will by the way they conduct themselves and by the way they arrange and maintain their work areas. Con Edison's reputation as a good neighbor is important. Do your part to preserve it by always using the work area protection principles described in this document when you are on the job.

#### Plan the Work and Work the Plan

In order to work efficiently and to minimize possible disruptions for pedestrians and vehicular traffic, it's important to prepare in advance before arriving at a work location. Here are some factors to consider:

Scheduling: When scheduling street work, try to avoid hours of unusually heavy traffic.

*Permits:* Review the work and Department of Transportation (DOT) permit requirements before planning work. Follow DOT stipulations.

Requirements include:

- posting of permits to face the nearest curb line at the work area setup. Posted permits must provide the following information: name of the contractor, start and expiration dates, contact telephone number, permit number, and type of work (gas, steam, or electric system). Lettering must be 1½ inches high;
- determining days and times to perform work;
- securing permission for lane closings.



*Efficient Deployment:* Maintain street work areas only for as long as is necessary. Move in quickly and safely, do the job, and move out. Minimize obstruction and excessive exposure to traffic.

*Materials:* Before leaving the yard, review work orders and make sure that all equipment and supplies are available to complete the job as promptly as possible.

#### **Evaluate the Work Area**

Determine how existing conditions will affect the job, and how work area protection must be adapted to the location. The following must be considered:

#### Vehicular Traffic:

- Assess the volume and speed of traffic.
- Arrange in advance with the appropriate authority to shut down a traffic lane when work must be done at approaches to and exits from tunnels and bridges.
- Allow for the free passage of emergency vehicles, including fire engines and ambulances.

*Pedestrian Traffic:* Observe the pedestrian routes to cross-walks and bus stops.

Changes in Work Plan: Reassess protective devices and working conditions based on any changes in the traffic patterns, or scope of work that may occur during the work operation. Business Establishments and Other Public Facilities: When excavations are to be made near schools, hospitals, theaters, or large business establishments, where there is substantial pedestrian and vehicular traffic, notify customers in advance so that they will be inconvenienced as little as possible.

#### Work Space Considerations

Use the following parameters in your planning so that the job setup can occupy the smallest work area consistent with safe operations:

Width of Work Area: Should not exceed the width of one traffic lane. Where this is impossible, the job should be done in steps. In congested areas with unusual traffic conditions, notify the local police precinct.

Length of Work Area: Should be separated from oncoming traffic by placing a tool cart, Pel bag, vehicle, or other suitable barrier between the working point and oncoming traffic. For increased protection, a buffer zone (the same width as the work area) should be located in front of the work area. The area in front of the buffer zone will be used to channelize and taper traffic flow away from the work area by using traffic cones and/or tubular markers.

#### Mobilization:

- Day or night, before moving out into traffic lanes, operate hazard-vehicle lights on vehicles. For tool carts, mount the message arrow and use channelizing devices (traffic cones and/or tubular markers), as well as the required warning signs.
- 2. Warn oncoming motorists during the move into traffic lanes. When necessary, a crew member equipped with a signaling device and wearing a retroreflective vest (as defined in the American National Standard for High-Visibility Apparel) should warn oncoming motorists.
- 3. If a traffic light is present, wait for the light before mobilizing equipment in or out of traffic lanes.
- 4. Some operations require work vehicles to be positioned facing oncoming traffic. Maneuvering a vehicle into such a position can present a risk to workers, the vehicle, and the public if it is not performed using good judgment and appropriate safety equipment, i.e., a hard hat, flag, and retroreflective clothing.
- 5. The vehicle's hazard lights must be in operation and visible to all approaching traffic during the maneuver until the vehicle is within a protected work area.
- 6. Select traffic-control devices to protect the work areas.

#### Following Through: Setting Up the Street Work Area

In creating the work area protection setup, these elements are a part of the job site characteristics to consider and the tools to use.

*Traffic Devices*: Set up the selected devices to control vehicle and pedestrian traffic and protect the work area. Provide clearly defined boundaries of street work areas throughout the work operation day and night.

Hard Hats and Vests: Employees exposed to vehicular traffic, e.g., when setting up, maintaining, removing, or working outside of work area protection, must wear hard hats and retroreflective safety apparel.

Advance Warning Signs: Remember, oncoming drivers must be able to see the work area if they are to avoid it. Therefore, night or day, arrange your traffic-warning equipment to provide advance warning to oncoming drivers. Channelizing devices tapered to move traffic away from the work area with a series of warning signs extended in the direction of oncoming traffic must be used.

Intersections: At intersections, place the most effective warning equipment so that it faces the heaviest oncoming traffic. Set up traffic-control devices on alternate sides of an intersection to control flow around a work area.

Lamp Reels: When taking temporary service from a lamppost, cover the open door with a lamppost apron to protect exposed wiring. (Contractors are required to use generators to obtain power.) ALWAYS lay cord along the curb. AVOID laying cord diagonally across traffic lanes. If necessary, use an extra lamp reel. Use shunt boards to cover cord and hose that protrude into pedestrian walkways or traffic lanes.

Pedestrian Passageways: Must be 5 feet wide. Protect pedestrian and bus-stop passageways where required (see Work Space Protection, page 13) with barricades, planking, steel plates, or shunt boards extending well beyond the defined passageway. Use signage to indicate alternate pedestrian paths and access to bus stops.

*Chock Equipment:* Vehicles and tool carts at work sites must be chocked.

Hazard-Vehicle Lights: If a vehicle must stand in lanes of moving traffic for work purposes and is not within a protected work area, the hazard-vehicle light(s) must be in operation day and night.

Street Openings: If it is necessary to leave street work areas unattended at night, provide traffic-control devices to include use of Type III barricades around the work area to protect motorists and pedestrians.

*Plating:* Provide plating or decking when required (see Excavation Operations, page 34). All road plates must be pinned and ramped to avoid pedestrian foot injury or injury to motorists due to plate movement.

Flood Lights: When it is dark, and when using flaggers, use flood lamps where required for additional protective illumination or work illumination. Lamp glare should not impede motorists or workers.

Confined Space: Before entering any underground structure, an atmospheric test of the structure must be made with an approved atmospheric gas monitor for oxygen deficiency, combustible gases, carbon monoxide, or other gases of concern. When opening any underground structure, guardrails must be in place to prevent falling into the structure and to prevent debris or other materials from entering. In addition, you must follow the appropriate entry procedures for enclosed or confined spaces.

Housekeeping: Good housekeeping is an important item in street work area protection.

#### Terminating the Job: Moving Out of the Work Area

Just as with setup of the work area, proper procedures must be observed when the job is finished and the site is being cleared.

Hazard-Vehicle Lights: Traffic-warning equipment and hazard-vehicle lights must be in operation while moving from traffic lanes to the curb.

*Flagger:* A trained member of the crew, wearing a retroreflective vest and hard hat, should warn oncoming motorists with a signaling device where necessary.

*Traffic Controls*: If a traffic light is present, wait for the red light before moving out of the traffic lane.

*Plates:* Ensure that all road plates are left pinned and ramped (see Excavation Operations, page 34) to maximize public safety.

Ongoing Work: If the job is shared by another Con Edison work area setup, make sure to leave the work area protection and the setup in good condition.

Housekeeping: Before leaving the area, inspect the site to be sure that no tools, equipment, or debris are left behind. Always work the job to make the public think well of you and the company. Remember, on the job, you are Can Edison.





The purpose of advance warning is to properly piert motorists and pedestrians to physical conditions abread.

It must effectively warn oncoming traffic, allowing adequate time for driver response. The employee must make the judgments necessary to establish and maintain effective advance warning.

#### **Advance Warning Signs**

Description: Warning signs must have a black legend on an orange background and be reflectorized for nighttime use. Diamond-shaped warning signs are preferred. However, where necessary, the alternate rectangular shape may be used. Minimum sizes for warning signs are 36 inches by 36 inches (diamond) and 36 inches by 24 inches (rectangle).

#### Signs Displaying the Symbol of a Worker or the Words "Road Work Ahead" or "Utility Work Ahead"

Instructions for Use: These signs are required to be posted for all work done in a traffic lane, parking lane, or on a shoulder. They must be posted first and in front of channelizing devices.

The sign displaying the symbol of a worker (the "worker symbol") may be used for short-duration work areas, while the "Road Work Ahead" and "Utility Work Ahead" signs are to be used for long-duration work areas (i.e., more than three days).

The sign may be mounted on portable "crashworthy" supports and must face oncoming traffic.

For short-duration work that occupies a location for up to three days, such as a manhole operation where workers are present or work in a parking lane, the standard distance between the warning sign and the lane closure or work area is 150 feet.

For long-duration work (more than three days), such as an excavation in a travel lane, the standard distance between the warning sign and the lane closure or work area is 300 feet.

Different distances may be used where necessary for more effective warning and guidance.

Signs placed on the sidewalk should be 2 feet in from the curb and at a height of 7 feet, where the sign is not likely to interfere with pedestrians or be obscured by parked vehicles. In rural areas, the height may be reduced to 5 feet.




Description: Lane closure warning signs must have a black legend and border on an orange background.

Instructions for Use: Advance notice of closed



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lanes must be provided when work areas must interrupt the flow of traffic in through lanes. This sign should be placed after the worker symbol or "Road Work Ahead" sign and may be placed at the beginning of the taper created by the use of channelizing devices.

# Directional Arrow Signs

Description: Orange reflectorized background at least 3 feet wide and 2 feet high with a clearly recognizable black arrow symbol. Standard or variable arrow signs (as shown) may be used.





Instructions for Use: The arrow may be mounted on a vehicle, tool cart, barricade, or portable supports. It must be mounted at a height of at least 4 feet to the bottom of the sign and must face in the direction of the oncoming traffic. The arrow must indicate the direction in which the traffic may pass.

Note: Arrow signs are intended to give motorists clear information and provide them with effective guidance. Therefore, care must be taken to ensure that the proper message is displayed at all times.

# "Flagger Ahead" Signs

Description: The "Flagger Ahead" sign must be diamondshaped, 36 inches by 36 inches, with a

black legend and border

on an orange background. It shows the silhouette of a person standing with the left arm (facing the viewer) extended horizontally and holding a flagstaff horizontally, with the flag

hanging down. The free arm is shown bent with the palm above shoulder level.

Instructions for Use: The "Flagger Ahead" sign shall be placed after the worker symbol or "Road Work Ahead" or "Utility Work Ahead" sign and well before the flagging location.

#### Street/Road Closed Signs

Description: This is a horizontal rectangular white sign, 48 inches by 30 inches, with a



black border and the words "Road Closed" in black on two lines.

Instructions for Use: The "Street Closed Ahead" sign should be used when the roadway is closed to all road users except contractors' equipment or officially authorized vehicles. This sign should be accompanied by appropriate warning and detour signage. This sign should be installed at or near the center of the roadway, on or above a Type III barricade that closes the roadway.



Note: New York City requires closedstreet permits from the DOT. The police department as well as the fire department's communications center require notification 24 hours in advance of non-emergency street closings. The local community planning board requires a notification seven days in advance when closing more than 50% of moving lanes per direction. Westchester permits vary by municipality.

#### High-Level Warning Devices

These devices are used in addition to signage. They can be lighted or unlighted as described below, and they provide clear, highly visible warning of the work area for both pedestrians and vehicles.

#### Flag Trees

Description: The flag tree should display a minimum of

two flags with their lowest corners at a height of 8 feet. Other warning signs may be mounted below the flags to alert and warn traffic in advance of a work area during daylight hours.

Instructions for Use: At work areas where the placement of the advance warning sign at the standard distances is not practical or is found to be ineffective, a flag tree may be used in conjunction with a worker symbol or road work ahead sign in advance of the work area (also in advance of any arrow boards) to effectively warn traffic. It must be placed at a sufficient distance in front of the work area to warn oncoming drivers.

#### Advance Warning Flasher: Type B High-Intensity Flashing Warning Lights

Description: The high-intensity, 7-inch (minimum) warning light (Type B) provides a flashing yellow light in one direction only, for use both day and night. These lights can be mounted on traffic cones, signs, flag trees, or barricades to warn road users. Warning lights must have a minimum mounting height of 30 inches. These warning lights must be in accordance with current Institute of Transportation Engineers (ITE) "Purchase Specification for Flashing and Steady-Burn Warning Lights."

Instructions for Use: At work areas where the placement of the advance warning sign at the standard distances is not practical, or is found to be ineffective, and the advance warning sign with flag tree is also found to be ineffective, the advance warning flasher may be used in conjunction with the advance warning sign to provide additional warning to oncoming traffic. When mounted on an advance warning sign, the distance from the roadway to the bottom of the lens of the light must be not less than 8 feet.







Note: The flag tree can be used in conjunction with the advance warning sign during daylight hours and/or the advance warning flasher during hours of darkness.

### Hazard-Vehicle Light

Description: Vehiclemounted, revolving (360 degrees) amber light.



Instructions for Use: The light must be displayed

and be visible to all approaching traffic when the vehicle is operated at a work site in the roadway and the vehicle is not within a protected work area.

#### Flashing-Arrow Panel

Description: The unit must consist of a black rectangular background at least 4 feet wide and 2 feet high with yellow flashing lights at least 4 inches in diamater, which form a clearly recognizable arrow symbol. Instructions for Use: The unit may be mounted at a height of at least 7 feet from the bottom of the unit on a trailer or other suitable support. Vehicle-mounted panels should be as high as practicable. This sign can provide additional warning and directional information to assist in merging and controlling traffic around the work area.

If using an arrow panel, the arrow or chevron mode must be used for lane closures on multi-



lane streets. If more than one lane is closed, a separate arrow panel must be used for each closed lane. The caution mode must be used in situations where one lane of a two-way street is closed. The caution mode may also be used for work (including surveying) done on shoulders and sidewalks near traffic situations.

Note: Arrow panels may be used in conjunction with warning signs. They may not be used to replace warning signs.

#### Work Space Protection

Work space protection involves the immediate area in which workers' activities are taking place. Consideration must be given to pedestrian and motorist protection. The work space is generally bordered by:

- tubular markers (stanchions) and tape, and/or by
- barricades Type I, Type II, or Type III.

Traffic-control devices, including channelizing devices, such as tubular markers and cones, as well as sign supports and barricades, must conform with new requirements set by the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance of Highway Features," and are to be constructed of crashworthy materials.

#### Protection of Pedestrians

Traffic-control devices used to delineate pedestrian walkways must be crashworthy so that if struck by a vehicle, there will be a minimal threat





to pedestrians, workers, and the occupants of vehicles.

When existing pedestrian paths are disrupted or closed, alternate routes must be provided to crosswalks and bus stops. Signage may be provided to improve recognition of a temporary pedestrian route.

Type II or Type III barricades should be used to channel pedestrians safely around the work space. Such barricades should be detectable to users of canes with a bottom rail no higher than 6 inches aboveground and a top rail at least 36 inches aboveground.

If storing materials outside of the work area setup near pedestrian pathways (sidewalks and crossings), Type III barricades should be used to channel pedestrians safely around these storage areas.

Note: If drums, cones, or tubular markers are used to channel pedestrians, there must be no gaps between the bases of these devices (this may

be a solid rail between devices), and the devices must be at least 36 inches in height:

#### Manhole Guardrail

Description: This quardrail is used for fall protection and is not a traffic-control device. This guardrail is yellow and equipped with

three sides and two rails, plus a toeboard. The height of the top rail must not be less than 42 inches.

Instructions for Use: Must be used at all open manholes and service boxes to protect personnel and pedestrians.

Note: Manhole guardrails equipped with an approved barricade panel (Type I) may be used in operations requiring stops in the roadway for only a brief period and when the use of a Type II or Type III barricade is not practical.

#### Tubular Markers (Stanchions) and Boundary Tape

Description: Tubular markers must be crashworthy\*, must consist of orange uprights at least 42 inches high with bases. and may be of a tubular or cone style. Each must have a minimum of two reflectorized bands near the top of the stanchion. The boundary tape is orange.



Instructions for Use: To outline the boundaries of street work areas such as:

- an open manhole that is protected by a manhole guardrail;
- vault cage entry;
- overhead pole work:
- setup around Vactor/flush trucks.

Note: Tubular markers and boundary tape are not to be used as substitutes where barricades are required (in areas around excavations and in areas of pedestrian traffic). Type II or





Type III barricades or Temporary Traffic Control (TTC) devices consisting of a bottom rail no higher than 6 inches above ground and a top rail at least 36 inches above ground should be used to channel pedestrians safely around the workspace.

\* Temporary Traffic-Control (TTC) devices used to delineate a TTC zone pedestrian walkway must be crashworthy (as defined under Work Space Protection, see page 13) and, when struck by vehicles, present a minimum threat to pedestrians, workers, and occupants of impacting vehicles.

#### Barricades

Description: Barricades must be crashworthy and are of three types:

Type I – Has one rail that must be a minimum length of 2 feet and a width of 8 inches to 12 inches.



Type II – Has two rails that must each be a minimum length of 2 feet and a width of 8 inches to 12 inches.

Type III – Has three rails that must each be a minimum length of 4 feet and a width of 8 inches to 12 inches.

In addition, for all types:

- Rails must be marked with alternate orange and white stripes at an angle of 45 degrees. Stripes must be 4 inches wide for rails less than 2 feet long and 6 inches wide for rails longer than 3 feet.
- Rails must be reflectorized for night use with a minimum of 270 square inches of reflective area facing traffic.

Instructions for Use: Barricades are used to mark an obstruction (work space) in the roadway and are required to outline excavations.





 The Type I barricade is used for temporary or short-duration work and for outlining excavations.

 The Type III barricade is normally used to face oncoming traffic for long-duration work where the barricade is to remain in the roadway for extended periods.

Type II or Type III barricades may be used to channel pedestrians safely around the work space. Type II or Type III barricades must be used at pedestrian crossings, as well as at sidewalks or other areas where pedestrians would normally come into contact with the work space.

- The stripes of barricades that face oncoming traffic should slope down toward the side on which traffic is to pass.
- Ballasts must not be placed on the top rail and must not consist of nondeformable objects such as rocks or concrete.





Note: The addition of company identification must not detract from the striping on the face of barricade rail(s) facing oncoming traffic.

#### Barricade Panels

Description: The face of barricade panels must be the same as the face of a barricade rail.

Instructions for Use: A single panel may be placed on the manhole guardrail, a temporary fence, vehicle, or other obstruction in the roadway when the use of a Type I barricade is not practical. The panel must face oncoming traffic, and the top of the panel must be at a minimum height of 3 feet.

#### Cones

Description: Cones must be orange and must be at least 28 or 36 inches in height with two reflectorized bands near the top. For nighttime use, cones must be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 28 to 36 inches in height must be provided by a 6-inch-wide white band located 3 to 4 inches from the top of the cone and an additional 4-inch-wide white band located approximately 2 inches below the 6-inch-wide band.

Instructions for Use: The primary function of cones is to channel traffic. The cone should be used to control and direct traffic around or through the work area by gradually narrowing the roadway and indicating the path to be followed. Cones may be used in combination with:

- a flag inserted in the top of the cone to enhance its target value during daylight hours;
- Type B warning lights (high-intensity flashers), which may be used day or night (warning lights must flash when used to warn of a condition);
- Type C steady-burn warning lights when used to channelize traffic.

# Signaling Devices

Description: Signaling devices must be one of the following types:

- Signal flag must be retroreflectorized red, at least 24 inches by 24 inches, securely fastened to a staff 36 inches long.
- Signal light a steadily burning red or red-orange flashlight wand.
- Paddle a combination "Stop" and "Slow" sign on an octagonal panel, at least 18 inches wide with letters 6 inches high, securely fastened to a rigid handle. Both faces must be retroreflectorized for nighttime use. The "Stop" face must be red with white letters and border. The "Slow" face must be orange with black letters and border.



Instructions for Use: Signaling devices should be used by flaggers to issue signals to oncoming traffic.

- The signal flag is for use during daylight hours, and the signal light is for use during hours of darkness at locations controlled by a single flagger.
- The "Stop" and "Slow" paddle is used day or night when more guidance to motorists is needed. However, it should not be used where display of the paddle face in the opposite direction would be inappropriate or misleading.

Use of the "Stop" and "Slow" paddle is preferable in a twoway traffic condition, such as the middle of a street, as opposed to an intersection where traffic may travel in four directions.

#### Safety Apparel

Description: Flaggers, as well as employees outside of the work area setup, must wear safety apparel that is compliant with the American National Standard for High-Visibility Apparel 107-1999, Class 2 or 3 risk exposures.

Instructions for Use: Vests or compliant apparel must be worn on the outside of all other clothing. Trained employ



clothing. Trained employees assigned as flaggers must wear safely apparel when controlling traffic. When leaving or working outside a protected work area, employees exposed to vehicle traffic, e.g., setting up, maintaining, or removing work area protection, must wear a safety vest. Surveyors and employees working in the roadway with minimum protection must wear a safety vest. safety vest is diminished when you crouch, bend, or move into a position that reduces your visibility or the reflective value of the vest.

# Flags (used in conjunction with traffic-control devices)

Description: Flags must be orange, a minimum of 16 inches by 16 inches, and attached to a staff at least 30 inches long.

Instructions for Use: Flags may be displayed in a manner that does not obscure the legend above any channeling device, on vehicles or tool carts, on tubular markers/stanchions and barricades, and above warning signs.

Note: Flags are a supplement to increase the target value and visibility of the work area during daylight hours. Flags may be placed at suitable intervals of not more than 20 feet during daylight hours on barricades used to outline excavations.

# Low-Intensity Warning Lights

Description: Low-intensity lighting is for use during nighttime hours only. All warning lights must comply with the ITE "Purchase Specification for Flashing and Steady-Burn Warning Lights," such as:

• Type A low-intensity flashing warning lights;

ing lights;



• Type D 360-degree steadyburn warning lights.

Instructions for Use: On barricades used to outline excavations, one light must be placed on the barricades at suitable intervals of not more than 20 feet. Use during hours of darkness only. (Use Type B high-intensity flashing warning lights for day and night.) Warning lights must have a minimum mounting height of 30 inches.

Traffic Control and Work Area Protection Arrangements



#### **Work Area Protection Diagrams**

This section provides graphic diagrams showing a variety of typical work locations. In each case, a scene is provided showing the work area protection properly deployed. In addition, a smaller "blueprint" diagram providing an overhead view of the job site helps to clarify the placement of signage, lights, barriers, and other work area protection equipment.

The arrangements shown in this section do not cover every possible work area configuration. They are intended to provide a representative sample of field conditions and to offer guidance when planning work area protection in similar settings. If you're not sure how to proceed, talk to your supervisor.

#### Using these diagrams as reference, you must also:

- 1. Review the DOT permit for conditions of work. Verify information if needed.
- 2. Select a traffic-control diagram that meets most nearly the requirements to control traffic at the work site.
- 3. Select a work area protection diagram for your type of operation.
- Set up the work site in accordance with the arrangements selected. Adapt the arrangements where necessary to meet local conditions.



# Work Area Protection Diagrams

These configurations are generally applicable to comparable work areas with similar road conditions.

- Setup for Pole Setting on Four-Lane Road With Two Lanes of Traffic in Each Direction
  - Setup for Bucket Truck on Curved Two-Lane Road With Two-Way Traffic
- Setup for Excavation in Middle Lane of Three Lanes of Traffic Moving in the Same Direction
- Setup for Flush Truck in One Lane of a Four-Lane Road With Two Lanes of Traffic in Each Direction
  - Setup for Tool Cart at an Intersection With Pedestrian Crosswalks
  - Setup for Cable Trucks at an Intersection With Pedestrian Crosswalks

Setup for Pole Setting on Four-Lane Road With Two Lanes of Traffic in Each Direction This configuration is generally applicable to comparable work areas with similar road conditions.

# Setup

- Where necessary, assign a flagger while the work area is being prepared.
- Place the advance warning sign at the beginning of the tapered work zone.
- Place the "Lane Closed" sign to appear in plain view after the advance warning sign for traffic traveling toward the one closed lane.
- Place traffic cones so that the traffic is tapered away from the work area.

- Set up tubular markers (stanchions) and boundary tape (tape may be used when pedestrians have restricted access to the work area).
- Post "Sidewalk Closed" sign near setup (optional).
- Post "Sidewalk Closed Use Other Side" sign on both sides of the work area, at the nearest corners to restrict pedestrian traffic on the work side of the street.

- advance warning sign ("Digger," "Work Area Ahead," or "Utility Work Ahead")
- flag tree and flags
- 28" or 36" traffic cones
- lane closure sign (arrow board or flashing-arrow panel)
- tubular markers (stanchions) and boundary tape
- sidewalk closed signage



# Setup for Bucket Truck on Curved Two-Lane Road With Two-Way Traffic This configuration is generally applicable to comparable work areas with similar road conditions.

#### Setup

- Assign three flaggers, one at each end of the work area, and one at a nearby intersection, to control the flow of two-way traffic in one lane. The flagger position should be within a protected area, such as the tapered area.
- Ensure communications among flaggers (walkie-talkies).
- Place the advance warning sign at the beginning of the tapered work zone for both sides of oncoming traffic.
- Place "Flagger Ahead" signs after the advance warning sign and well before the flagger position.

- Place the "Lane Closed" sign to appear in plain view after the advanced warning sign for traffic traveling toward the one closed lane.
- Place the "Lane Closed" sign for traffic approaching on the opposite side of the double yellow line (optional).
- Place traffic cones so that upstream and downstream traffic are both tapered away from the work area.
- Set up tubular markers (stanchions) and boundary tape to extend around work areas (tape may be used when pedestrians have restricted access to the work area).

- 2 advance warning signs ("Digger," "Work Area Ahead," or "Utility Work Ahead")
- 2 flag trees and flags
- 2 lane closure signs (arrow board or flashing-arrow panel)
- 2 "Flagger Ahead" signs
- 8 28" or 36" traffic cones
- tubular markers (stanchions) and boundary tape
- Type B flashers (optional)
- 3 sets of flagger communication equipment
- 3 flagger paddles



Setup for Excavation in Middle Lane of Three Lanes of Traffic Moving in the Same Direction This configuration is generally applicable to comparable work areas with similar road conditions.

#### Setup

- Where necessary, assign a flagger while the work area is being prepared.
- Place the advance warning sign at the beginning of the tapered work zone.
- Place the "Lane Closed" sign in plain view after the advance warning sign.
- Place traffic cones so that the traffic is tapered away from the work area.

- Place sturdy barricades around the excavation work area.
- Filled Pel bags should be placed inside the work area nearest barricades that are most at risk of impact from oncoming traffic.

- advance warning sign ("Digger," "Work Area Ahead," or "Utility Work Ahead")
- flag tree and flags
- ≥ 28" or 36" traffic cones
- Iane closure sign (arrow board or flashing-arrow panel)
- 🗮 Type B flashers (optional)



Setup for Flush Truck in One Lane of a Four-Lane Road With Two Lanes of Traffic in Each Direction This configuration is generally applicable to comparable work areas with similar road conditions.

#### Setup

- Where necessary, assign a flagger while the work area is being prepared.
- Place the advance warning sign at the beginning of the tapered work zone for both sides of oncoming traffic.
- Place the "Lane Closed" sign, to appear in plain view after the advance warning sign for traffic traveling toward the one closed lane.
- Place the flashing-arrow panel, in the caution mode (no arrow) for traffic approaching on the opposite side of the double yellow line (optional).
- Place traffic cones so that the oncoming traffic is tapered away from the work area.

- Place traffic cones to ease the downstream traffic flow and maintain separation of traffic flowing in the opposite direction.
- Set up tubular markers (stanchions) and boundary tape to extend completely around the flush operation (tape may be used when pedestrians have restricted access to the work area).

- 2 advance warning signs ("Digger," "Work Area Ahead," or "Utility Work Ahead")
- 2 flag trees and flags
- 🛯 28" or 36" traffic cones
- lane closure sign (arrow board or flashing-arrow panel)
- flashing-arrow panel, in the caution mode (optional)
- tubular markers (stanchions) and boundary tape
- Type B flashers (optional)
- 🕷 manhole guardrail



# Setup for Tool Cart at an Intersection With Pedestrian Crosswalks This configuration is generally applicable to comparable work areas with similar road conditions.

#### Setup

- Where necessary, assign a flagger while the work area is being prepared.
- This work area is immediately preceded by a parking lane. Place one advance warning sign in the parking lane and another advance warning sign for traffic that is restricted to the left of the work area.
- Place the "Lane Closed" sign so that it appears in plain view after the advance warning sign for traffic that is restricted to the left of the work area. ("Lane Closed" signs are not required for parking lanes.)
- Place traffic cones so that the traffic is tapered away from the work area for oncoming traffic. Maintain pedestrian access

to crossings not affected by the work area.

- Maintain pedestrian safety from upstream traffic at all relocated crossings with placement of Type III barricades or with barricades equipped with a bottom rail at most 6 inches above street level and a top rail at least 36 inches high (see Protection of Pedestrians, page 13).
- Place Type B flashers on barricades at pedestrian crossings.
- Post the "Pedestrian Crossing" sign to redirect pedestrian traffic.
- Set up tubular markers (stanchions) and boundary tape to extend around work areas (tape may be used when pedestrians have restricted access to the work area).

- 2 advance warning signs ("Digger," "Work Area Ahead," or "Utility Work Ahead")
- 2 flag trees and flags
- 28" or 36" traffic cones
- 1 lane closure sign (arrow board or flashing-arrow panel)
- Type III barricades or barricades equipped with two rails
- tubular markers (stanchions) and boundary tape
- 2 to 4 Type B flashers required
- "Pedestrian Crossing" sign (optional)
- manhole guardrail



# Setup for Cable Trucks at an Intersection With Pedestrian Crosswalks This configuration is generally applicable to comparable work areas with similar road conditions.

#### Setup

- Where necessary, assign a flagger while the work area is being prepared.
- Place the advance warning signs on the far side of the intersection for traffic traveling upstream and for traffic that is restricted from turning into that lane.
- Place the "Lane Closed" sign to appear in plain view after the advance warning sign for traffic traveling toward the one closed lane.
- Place traffic cones so that the traffic is tapered away from the work area for oncoming traffic.
- Maintain pedestrian access to crossings not affected by the work area.

- Maintain pedestrian safety from upstream traffic at all relocated crossings with placement of Type III barricades or with barricades equipped with a bottom rail at most 6 inches above street level and a top rail at least 36 inches high (see Protection of Pedestrians, page 13).
- Place Type B flashers on barricades at pedestrian crossings.
- Post the "Pedestrian Crossing" sign to redirect pedestrian traffic.
- Set up tubular markers (stanchions) and boundary tape to extend around work areas (tape may be used when pedestrians have restricted access to the work area).

- 2 advance warning signs ("Digger," "Work Area Ahead," or "Utility Work Ahead")
- 2 flag trees and flags
- 28" or 36" traffic cones
- 2 lane closure signs (arrow board or flashing-arrow panel)
- Type III barricades or barricades equipped with two rails
- tubular markers (stanchions) and boundary tape
- 2 to 4 Type B flashers required
- "Pedestrian Crossing" sign (optional)
- manhole guardrail and boundary tape
- Sidewalk Closed" signage



#### **Excavation Operations**

Where operations require open trenches and pedestrian or vehicular traffic requires maintaining passageways or traffic lanes, plates should be used.

- Plates must be large enough to span the opening, must have a minimum bearing area 1 foot wide on each side of the trench, and must be adequate to carry the load.
- Trench walls and adjacent soil must be sufficiently stable for the use of plates.
- Area at the edge of plates must be tapered to provide smooth riding and safer walking conditions. *It is important to avoid pedestrian tripping hazards or plate movement.*
- Plates must be fastened with spikes in pre-drilled holes or spiked securely from the side so that they will not move off the openings.
- For wide trenches or where unstable soil conditions exist, consideration should be given to construction of temporary bridges.



# **Flagger at Work Sites**

A flagger will be required for certain work operations where the traffic must be stopped or controlled.

- Flaggers must wear safety apparel that is compliant with American National Standard for High-Visibility Apparel 107-1999, Class 2 or 3 risk exposure.
- The flagger must be clearly visible at all times to approaching traffic for a distance sufficient to permit proper response by the motorist to the flagger's instructions and to permit traffic to reduce speed before entering the work zone.
- The "Flagger Ahead" sign must precede the flagger station.
- Flaggers must be illuminated at night.
- Floodlights must not produce a disabling glare condition for approaching road users, flaggers, or workers.









06-W-0490

# LEBOEUF, LAMB, GREENE & MACRAE LLP

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April 21, 2006

# **BY HAND DELIVERY**

Honorable Jaclyn A. Brilling Secretary New York State Public Service Commission Three Empire State Plaza Albany, New York 12223-1350

> Re: Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale of the Shares of the Common Stock of American Water Works Company, Inc.

Dear Secretary Brilling:

On behalf of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation, enclosed please find an original and five (5) copies of the Joint Petition for Approval of the Merger and the Subsequent Sale of the Shares of the Common Stock of American Water Works Company, Inc.

If you have any questions regarding this filing, please contact me.

Sincerely,

Bian J. Folgelerald / clc

Brian T. FitzGerald

BTF/cd (94748) Enclosures

cc: Michael Sgro

# BEFORE THE STATE OF NEW YORK PUBLIC SERVICE COMMISSION

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Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

Case 06-W-<u>049</u>0

JOINT PETITION OF THAMES WATER AQUA HOLDINGS GmbH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION FOR APPROVAL OF THE MERGER OF THAMES WATER AQUA US HOLDINGS, INC. WITH AND INTO AMERICAN WATER WORKS COMPANY, INC. AND THE SUBSEQUENT SALE OF THE SHARES OF THE COMMON STOCK OF AMERICAN WATER WORKS COMPANY, INC.

Frank J. Miller Brian T. FitzGerald

Of Counsel

LeBoeuf, Lamb, Greene & MacRae LLP 125 West 55<sup>th</sup> Street New York, New York 10019-5389 Tel: (212) 424-8000 Fax: (212) 424-8500 Michael A. Sgro Vice President, Secretary and General Counsel

Long Island Water Corporation American Water Northeast Region 131 Woodcrest Road Cherry Hill, New Jersey 08003 Tel: (856) 310-2210 Fax: (856) 310-2279

Dated: April 21, 2006

JOINT PETITION OF THAMES WATER AQUA HOLDINGS GmbH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION FOR APPROVAL OF THE MERGER OF THAMES WATER AQUA US HOLDINGS, INC. WITH AND INTO AMERICAN WATER WORKS COMPANY, INC. AND THE SUBSEQUENT SALE OF THE SHARES OF THE COMMON STOCK OF AMERICAN WATER WORKS COMPANY, INC.

#### A. INTRODUCTION

1. Thames Water Aqua Holdings GmbH ("Thames GmbH"); Thames Water Aqua US Holdings, Inc. ("TWAUSHI"); American Water Works Company, Inc. ("American Water"); and Long Island Water Corporation ("Long Island Water") (hereinafter collectively referred to as "Joint Petitioners"), pursuant to Section 89-h of the New York State Public Service Law ("Section 89-h") and such other statutory and regulatory authority deemed appropriate,<sup>1</sup> hereby request that the New York State Public Service Commission ("Commission") approve (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of TWAUSHI with and into American Water, with American Water being the surviving corporation (the transactions set forth in (i) and (ii) are increinafter collectively referred to as the "Proposed Transaction"). The offerings will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange. The Joint Petitioners submit that the Proposed Transaction is in the

<sup>1</sup> TWAUSHI is a foreign corporation and American Water is a foreign holding company, neither of which is certified to provide utility service in New York. Accordingly, Joint Petitioners believe that the Commission need not approve the proposed merger. However, should the Commission assert jurisdiction, the Joint Petitioners hereby request that any required approvals be granted.

public interest and will result in the continuous and seamless provision of reliable service by

Long Island Water to all of its customers at just and reasonable rates.

2. The name, mailing and e-mail addresses, and telephone and facsimile numbers of the Joint Petitioners' attorneys are as follows:

Frank J. Miller Brian T. FitzGerald LeBoeuf, Lamb, Greene & MacRae, LLP 125 West 55<sup>th</sup> Street New York, NY 10019-5389 Phone: (212) 424-8000 Fax: (212) 424-8500 Email: <u>fmiller@llgm.com</u> Email: bfitzger@llgm.com Michael A. Sgro Vice President, Secretary and General Counsel Long Island Water Corporation American Water Northeast Region 131 Woodcrest Road Cherry Hill, New Jersey 08003 Tel: (856) 310-2210 Fax: (856) 310-2279 Email: msgro@amwater.com

# B. <u>OVERVIEW</u>

3. For nearly 60 years, American Water was one of the largest publiclytraded water companies in the United States, with its shares listed on the New York Stock Exchange. The Proposed Transaction is expected to result in American Water becoming the largest publicly-traded water company in the U.S. Being publicly-traded, like so many utility holding companies, served American Water, its subsidiaries, and their customers and employees well for many years and will again serve them well going forward.

4. As a publicly-traded company, American Water will be managed under the supervision of American Water's board of directors. Long Island Water will continue to be operated by its local management, under the supervision of Long Island Water's board of directors.

5. American Water will have a sound financial structure and, as a publiclytraded company, will be subject to the extensive disclosure and governance requirements of the Securities and Exchange Commission ("SEC") (including Sarbanes-Oxley-related requirements) and the stock exchange on which its shares are traded (intended to be the New York Stock Exchange).

6. The Proposed Transaction will also provide American Water with access to the public equity and debt capital markets in the U.S., maintaining American Water's ability to finance necessary and vital investments in the infrastructure of its subsidiaries, including Long Island Water.

7. The Proposed Transaction will produce benefits for Long Island Water's customers. It will result in a publicly-traded company that is focused on water and wastewater in the U.S. and dedicated to maintaining a high level of service at just and reasonable rates. Following the Initial Public Offering ("IPO"), customers will be able to invest in their water utility by buying American Water stock.

8. The Proposed Transaction should also facilitate the attraction and retention of highly-qualified and capable employees. Employees will be able to invest in their water utility by buying American Water stock. In addition, American Water may create an employee stock ownership plan following the Proposed Transaction.

9. The Proposed Transaction is beneficial to American Water and Long Island Water and their customers and employees and clearly is in the public interest.

# C. DESCRIPTION OF THE JOINT PETITIONERS

10. For ease of reference, the current relationships among the Joint Petitioners are shown on the organization chart, attached hereto as Exhibit A, Page 1. Exhibit A, Page 2 presents the contemplated organization chart following the consummation of the Proposed Transaction.

11. RWE Aktiengesellschaft ("RWE") is a foreign corporation organized and existing under the laws of the Federal Republic of Germany. RWE's principal office is located at Opernplatz 1, 45128 Essen, Federal Republic of Germany.

12. Thames GmbH is a foreign corporation organized and existing under the laws of the Federal Republic of Germany. Thames GmbH's principal office is located at Opernplatz 1, 45128 Essen, Federal Republic of Germany. It is a wholly-owned subsidiary of RWE. Thames GmbH is the holding company for most of RWE's water operations, both in the United States and in several foreign countries. Attached as Exhibit B is a copy of the certified excerpt from the Commercial Register of the Local Court of the City of Essen on the registration of Thames GmbH with that Commercial Register.

13. TWAUSHI is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ 08043. TWAUSHI is a wholly-owned subsidiary of Thames GmbH. In turn, TWAUSHI is the direct parent company of American Water. TWAUSHI does not conduct business in New York State, nor is it authorized to do so. TWAUSHI's subsidiaries now have approximately 7,000 employees and provide water, wastewater services and other water resource management services to approximately 18 million customers in 29 states and Canada. A certified copy of TWAUSHI's Certificate of Incorporation is attached as Exhibit C.

14. American Water is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ 08043. American Water owns regulated operating subsidiaries in 18 states. American Water does not conduct business in New York State, nor is it authorized to do so. A certified copy of American Water's Restated Certificate of Incorporation is attached as Exhibit D.

15. Long Island Water is a wholly-owned subsidiary of American Water. It is a regulated waterworks corporation organized and existing under the laws of the State of New York, with its principal office located at 733 Sunrise Highway, Lynbrook, New York. Long Island Water serves approximately 74,500 customers in southwestern Nassau County, New York. Long Island Water currently owns, operates and maintains potable water production, treatment, storage, transmission and distribution systems for the purpose of furnishing potable water for residential, commercial, industrial and governmental users in its service territory. A certified copy of Long Island Water Corporation's Amended and Restated Certificate of Incorporation was filed as Exhibit B to the Joint Petition of Long Island Water Corporation, American Water Works Company, Inc., Thames Water Aqua Holdings GmbH, and Apollo Acquisition Company for Approval of an Agreement and Plan of Merger Pursuant to Section 89h of the New York Public Service Law on December 20, 2001 in Case 01-W-1949.

# D. DESCRIPTION OF THE PROPOSED TRANSACTION

16. The Proposed Transaction consists of (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water and (ii) prior to the closing of the IPO, the merger of TWAUSHI with and into American Water. The shares will be sold through one or more underwritten public offerings to a broad group of investors, including institutional and retail investors. It is the desire of Thames GmbH to sell 100% of the shares in the IPO.

Depending on market conditions, Thames GmbH may decide not to sell 100% of the shares in the IPO. The remainder of the shares would then be sold in a subsequent offering or offerings as soon as reasonably practicable following the IPO. The IPO and any subsequent public offerings will be conducted according to the rules for underwritten public offerings mandated by the SEC. The process for the IPO and any subsequent public offering is substantially the same, although the timeframe for subsequent public offerings is generally shorter. The following paragraphs describe this process in general terms.

17. The key participants in an underwritten public offering such as this one are the company in which the shares are being sold (in this case, American Water), which is referred to as the issuer; the underwriters, which will be a group of investment banks; and the seller of the shares (in this case, Thames GmbH). The primary role of the issuer is to prepare the necessary SEC filings, which include the prospectus that will be used to offer the shares to investors, and to have its senior management participate in marketing the offering to investors by, among other things, explaining American Water's business model, including its commitment to quality, health, safety, and efficient water resource management. The underwriters' role includes assistance in drafting the prospectus, leading the marketing effort, and participating in setting the price for the sale.

18. The first step in a public offering is the preparation and filing with the SEC of a registration statement. The registration statement for this type of offering is a document containing extensive information about the issuer and the offering. This primarily historical information includes, among other things, the issuer's audited financial statements, descriptions of its business and management, and other information about the issuer and the offering that investors may consider in deciding to buy the shares. The primary portion of an
SEC registration statement is the prospectus, which is the document used to market the offering. The prospectus will include a clear statement that no investor is permitted to acquire control of American Water without obtaining any necessary regulatory approvals pursuant to applicable state laws.

19. Once an initial registration statement has been prepared, it will be filed with the SEC, at which point it will become publicly available on the SEC's web site. It is anticipated that this initial filing with the SEC will not occur before late 2006, when the state regulatory approval process is well underway. The SEC will review the initial registration statement and provide initial comments on the filing within four to six weeks of the filing, at which point American Water will file an amended registration statement addressing the SEC's comments. The amended registration statement will also become immediately available on the SEC's web site. The SEC may have further comments, in which case additional amendments must be filed until all comments are resolved. This review and comment process typically takes between two and three months from the time the initial registration statement is first filed with the SEC.

20. After the principal SEC comments have been resolved and the state regulatory approval process (including obtaining the approval of the Commission) has been completed, the marketing process will begin. During the marketing process, American Water's senior management, as well as some presidents of its utility subsidiaries, will travel throughout the United States to meet with potential investors on what is known as a "Road Show."

21. At the end of the marketing process, American Water will ask the SEC to declare the registration statement effective, and the underwriters and Thames GmbH will agree on a price per share at which the shares will be sold to the public. This stage is known as the

"Pricing." The agreement between Thames GmbH and the underwriters will be reflected in an underwriting agreement that is signed immediately after pricing.

22. As a technical matter, in an underwritten offering, the underwriters agree to buy the shares from the seller (pursuant to the underwriting agreement) and then in turn agree to re-sell them to the investors. Both the purchases by the underwriters and the subsequent sales are usually completed on the same day, at the closing of the offering. Although it is possible that investors could back out of their indication of interests, leaving the underwriters with an unsold allotment, this type of situation is uncommon. In such event, each underwriter must purchase its proportionate share of the unsold allotment, and each underwriter typically seeks to sell those shares as soon as reasonably practicable thereafter.

23. The closing of the offering, at which the purchases are settled, is required to take place three or four business days after pricing. The stock begins trading in the public market after pricing. In this case, the shares are intended to be listed on the New York Stock Exchange.

# E. CAPITAL STRUCTURE AND GOVERNANCE

24. The Proposed Transaction will not impair the ability of Long Island Water to maintain a reasonable capital structure that is representative of other utilities.

25. The debt of Long Island Water consists of (i) third-party debt issued by Long Island Water in the capital markets and (ii) inter-company debt owed by Long Island Water to American Water Capital Corp. ("AWCC"), which is a direct subsidiary of American Water. As of December 31, 2005, Long Island Water's debt consisted of \$38,930,000 in third-party debt and \$7,762,762 in inter-company debt to AWCC.

26. American Water has used AWCC as a financing vehicle since before RWE's acquisition of American Water. The purpose of AWCC is to borrow funds for the benefit of American Water and its regulated operating subsidiaries and then loan such borrowed funds to such companies. The advantage of this financing structure is that it allows Long Island Water to benefit from the economies of scale associated with group-wide debt financing and decreased administrative costs.

27. AWCC's debt consists of corporate loans from its ultimate parent, RWE, and a small amount of debt issued in the capital markets. As of December 31, 2005, AWCC's debt consisted of \$2,438,586,000 in inter-company debt to RWE and \$226,860,000 in third-party debt. AWCC is currently rated 'A-' (on negative credit watch) by Standard & Poor's and 'Baa1' (on negative outlook) by Moody's Investors Service, Inc. These ratings reflect the support AWCC receives from American Water.

28. In addition, as of December 31, 2005, American Water had inter-company debt to RWE of \$150,000,000. RWE also indirectly holds \$1.75 billion of preferred shares of American Water.

29. In connection with the Proposed Transaction, all inter-company financial relationships RWE has with American Water and its subsidiaries will be terminated. The precise timing and composition of any replacement financing will depend upon market conditions prevailing at the time of the financing. Following the Proposed Transaction, the capital structure of American Water is intended to be comparable to that of other publicly-traded utilities. American Water's objectives in designing this capital structure will be to provide ready and cost-efficient access to necessary capital and to maintain a solid investment grade rating for AWCC.

30. In certain instances, the refinancing of AWCC's debt with RWE may require changes in terms of the inter-company debt and Long Island Water will, if so required, seek approval from the Commission in a separate petition for any such changes that are determined to be necessary in connection with the refinancing.

31. Following the IPO, the board of directors of American Water will meet the requirements for boards of public companies. The board will consist of experienced individuals who, in the aggregate, possess the capabilities and experience appropriate for the board of a large, publicly-owned multi-state water utility. Federal securities laws and stock exchange rules also require, following completion of the Proposed Transaction, that the board have a majority of independent directors and that the audit, compensation and nominating committees consist entirely of independent directors.

32. As a publicly-traded company, American Water will become subject to the federal securities laws and regulations as well as the requirements of the stock exchange where American Water's common shares will be listed. Specifically, such laws and regulations will impose obligations on American Water and its subsidiaries related to financial reporting, accounting, internal controls, general business disclosure, corporate governance, executive compensation reporting, issuance of securities and related financial and business matters. American Water will be required to file annual, quarterly and current reports (relating to certain business events) with the SEC, and certain American Water investors will be required to make filings disclosing their American Water shareholdings (including, under certain circumstances, the purpose of acquiring such shareholdings). All financial information of American Water and its subsidiaries will have to be reported in accordance with U.S. generally accepted accounting principles ("GAAP") and SEC regulations. The annual consolidated financial statements of

American Water will be required to be audited. In addition, all filings with the SEC will be made immediately available on the SEC's web site, not only to investors, but to the public at large. American Water will also be required to comply with the extensive requirements imposed as a result of the recent federal Sarbanes-Oxley legislation. These requirements relate to, among other things, internal controls over financial reporting and external audit of such controls, corporate officer certification of financial and other information, corporate governance requirements, and enhanced and expedited disclosure (particularly with respect to certain financial information).

# F. THE PROPOSED TRANSACTION IS IN THE PUBLIC INTEREST

33. This Petition is being filed pursuant to Section 89-h of the New York State Public Service Law that provides which "[n]o [water works] corporation shall directly or indirectly acquire the stock or bonds of any other corporation incorporated for, or engaged in, the same or similar business, or proposing to operate or operating under a franchise from the same or other municipality, unless authorized to do so by the commission [and] no stock corporation of any description, domestic or foreign, other than a water-works corporation, shall purchase or acquire, take or hold, more than ten per centum of the voting capital stock issued by any waterworks corporation organized or existing under or by virtue of the laws of this state..." without the consent of the Commission.

34. In considering a request for approval pursuant to Section 89-h, the Commission is required to assess whether the transaction is in the public interest. Section 89-h provides, in pertinent part, that, "[n]o consent shall be given by the Commission to the acquisition of any stock in accordance with this section unless it shall have been shown that such acquisition is in the public interest." The Proposed Transaction clearly meets this test. As

detailed in the remainder of this section, the Proposed Transaction will result in a company with a sound financial structure that is focused on the water and wastewater business in the U.S., that will be well managed and that will provide benefits to both customers and employees of Long Island Water.

35. For nearly 60 years, American Water was one of the largest publiclytraded water companies in the United States, with its shares listed on the New York Stock Exchange. The Proposed Transaction is expected to result in American Water becoming the largest publicly-traded water company in the U.S. Being publicly-traded, like so many utility holding companies, served American Water, its subsidiaries, and their customers and employees well for many years and will again serve them well going forward.

36. The Proposed Transaction will result in a publicly-traded company that is focused on the water and wastewater business in the U.S. As a publicly-traded company, American Water will be better positioned to focus on maintaining, developing and growing the water and wastewater business of its subsidiaries, including Long Island Water, and on the needs of customers and employees.

37. Following the Proposed Transaction, American Water will be subject to the extensive disclosure requirements of the SEC (including Sarbanes-Oxley-related requirements) and the stock exchange on which its shares are traded. See Section D. American Water shareholders owning a significant number of shares will also be required under SEC regulation to report their American Water shareholdings publicly. Such disclosure will result in greater corporate transparency, including with respect to the operations and ownership of American Water and its subsidiaries.

38. The Proposed Transaction will provide American Water with access to the public equity and debt capital markets in the U.S., maintaining American Water's ability to finance necessary and vital investments in the infrastructure of its subsidiaries, including Long Island Water.

39. Long Island Water will continue to be a subsidiary of American Water and will be operated by its management, under the supervision of its board of directors. The experienced management at Long Island Water will continue to provide its financial, technical and managerial abilities to Long Island Water for the benefit of its customers and the communities they live in. American Water Works Service Company, Inc. will continue to provide customer service, accounting, administration, engineering, financial, human resources, information systems, operations, risk management, water quality and other services to Long Island Water in place with Long Island Water.

40. American Water will continue to be operated by its management, under the supervision of its board of directors. The seasoned management team at American Water has (and will continue to have) the background necessary to run a large, publicly-traded water company.

41. The Proposed Transaction will result in a publicly-traded company that is focused on providing water and wastewater services to the public in the U.S. and dedicated to maintaining a high level of service at just and reasonable rates for the benefit of its customers and the communities it serves. Customers of Long Island Water will continue to receive the same high quality of service from highly-qualified employees, just as in the past.

42. Following the Proposed Transaction, customers will also be able to invest in their water utility by buying American Water stock.

43. The Proposed Transaction should facilitate the attraction and retention of highly-qualified and capable employees who will be drawn to working for a prestigious, highprofile, publicly-traded company. Employees will be able to invest in their water utility by buying American Water stock. In addition, American Water may create an employee stock ownership plan following the Proposed Transaction.

44. Long Island Water will continue to honor its collective bargaining agreements. The Proposed Transaction will not adversely impact employees or employment levels in New York State.

45. The Proposed Transaction will not adversely impact Long Island Water's rates or its policies with respect to service to customers, employees, operations, financing, or other matters affecting the public interest or utility operations. The transition to a publicly-traded company will similarly not adversely impact current investment and capital programs.

46. There are no material contemplated changes in the income statement, balance sheet or financial position of Long Island Water as a result of the Proposed Transaction. Applicants do not expect any adjustment to the existing book value of any of Long Island Water's assets as a result of the Proposed Transaction. Applicants do not seek recovery of the costs of the Proposed Transaction, which are comprised of the SEC registration fee, the NASD filing fee, the stock exchange listing fee, legal fees and expenses of the Proposed Transaction, accounting fees and expenses of the Proposed Transaction, printing and engraving fees and

expenses for the registration statement, Blue Sky fees and expenses, transfer agent fees and expenses, and legal fees for the state regulatory approval process.

47. Long Island Water will continue to provide safe, adequate and reliable service in fulfillment of its obligations under New York State and federal law.

48. Long Island Water, together with American Water, will continue to make extensive contributions to the state and local economies and continue Long Island Water's commitment to the local communities it has known and served for years.

49. The Proposed Transaction does not affect the Commission's powers with respect to Long Island Water or the authority of other governmental agencies as to Long Island Water's services or facilities. Long Island Water will remain subject to all applicable laws, regulations, rules, decisions and policies governing the regulation of New York State public utilities.

50. RWE has no intention of permitting any person to acquire a controlling interest in American Water through the Proposed Transaction. Consequently, the Joint Petitioners do not request approval for any individual or group to acquire a controlling interest in American Water in either the IPO or subsequent public offerings. New York State statutes prohibit any person from acquiring a controlling interest in a utility holding company such as American Water without first obtaining approval from the Commission. Section 89-h specifies that any such acquisition consummated without the requisite prior approval is void. The prospectus pursuant to which the shares will be sold in the IPO will include disclosure about the relevant statutory restrictions and the consequences of a violation.

51. For the reasons stated in the preceding paragraphs of this Section, the Proposed Transaction is clearly in the public interest.

# G. SUPPORTING DATA

52. Because the Proposed Transaction is an IPO for the sale of stock and not an acquisition, 16 NYCRR Part 39 is not applicable to the Proposed Transaction. However, the Joint Petitioners have used Part 39 as a guide to the type of information included herein. Section 39.1(a) of the regulations requires that the applicant's financial condition be submitted (if it is a public utility) and for the corporation whose stock is sought to be acquired. Because the IPO will not occur until after approval of the Proposed Transaction, the Joint Petitioners are unable to provide financial information about potential acquiring parties. Moreover, American Water is a foreign non-utility holding company whose stock, in turn, is wholly-owned by TWAUSHI, also a foreign non-utility holding company. Accordingly, the detailed information that is required of a public utility relating to financial conditions as set forth in 16 NYCRR Section 18.1 is inapplicable to the Proposed Transaction.

53. With respect to the merger of TWAUSHI with and into American Water, as a result of the merger each outstanding share of TWAUSHI will be cancelled and cease to exist. Following the consummation of the merger, Thames GmbH will be the sole shareholder of American Water.

54. A statement listing the filings made or to be made with Federal and state authorities before the Proposed Transaction can be consummated is attached as Exhibit E. No authorizations have been received to date.

55. Coincident with the filing of this Petition, Joint Petitioners shall file with the Commission a short-form Environmental Assessment Form. For convenience, a copy of the filing is attached as Exhibit F.

## H. CORPORATE APPROVALS

56. The Proposed Transaction will have been, before its execution, approved by the Supervisory Board of RWE and by the boards of directors of the Joint Petitioners. Approval by the Shareholders of RWE is not required.

# I. <u>NOTICE</u>

57. Notice of the Proposed Transaction will be provided to customers of Long Island Water by way of a bill insert no later than the next full billing cycle after filing of this Petition. In addition, the Joint Petitioners have prepared, and attached as Exhibit G, a draft State Administrative Procedure Act notice suitable for publication in the New York State Register. WHEREFORE, for the foregoing reasons, the Joint Petitioners respectfully

request that the Commission approve this Petition and authorize the Proposed Transaction and the resulting transfer of control of Long Island Water.

Respectfully submitted,

Brian J. Felz Herald / clc

April 21, 2006

Frank J. Miller Brian T. FitzGerald

Of Counsel

LeBoeuf, Lamb, Greene & MacRae LLP 125 West 55<sup>th</sup> Street New York, New York 10019-5389 Tel: (212) 424-8000 Fax: (212) 424-8500 Email: <u>fmiller@llgm.com</u> Email: bfitzger@llgm.com

AL94733.4

Michael A. Sgro Vice President, Secretary and General Counsel Long Island Water Corporation American Water Northeast Region 131 Woodcrest Road Cherry Hill, New Jersey 08003 Tel: (856) 310-2210 Fax: (856) 310-2279 Email: <u>msgro@amwater.com</u>

# BEFORE THE STATE OF NEW YORK PUBLIC SERVICE COMMISSION

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Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

) )ss:. Case 06-W-

# **VERIFICATION**

STATE OF NEW JERSEY

COUNTY OF CAMDEN

Michael A. Sgro, being duly sworn, deposes and states as follows:

- 1. I am Vice President, Secretary and General Counsel of Long Island Water Corporation.
- 2. I am authorized to sign this verification on behalf of Long Island Water Corporation.
- 3. I have reviewed the foregoing Joint Petition and the statements of fact contained therein are true and correct to the best of my knowledge, information and belief.

lichael A. Sgro

Sworn to and subscribed before me this 20 day of April, 2006.

Notary Public

SUSAN J. MALLETT NOTARY PUBLIC OF NEW JERSEY MY COMMISSION EXPIRES JANUARY 14, 2009

# BEFORE THE STATE OF NEW YORK PUBLIC SERVICE COMMISSION

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

Case 06-W-

## **VERIFICATION**

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STATE OF NEW JERSEY

COUNTY OF CAMDEN

John R. Bigelow, being duly sworn, deposes and states as follows:

- 1. I am Senior Vice President, Regulatory Programs & Enterprise Risk Management for American Water Works Company, Inc. ("American Water") and Thames Water Aqua US Holdings, Inc. ("TWAUSHI").
- 2. I am authorized to sign this verification on behalf of American Water and TWAUSHI.
- 3. I have reviewed the foregoing Joint Petition and the statements of fact contained therein are true and correct to the best of my knowledge, information and belief.

ohn R. Bigelow

Sworn to and subscribed before me this 20th day of April, 2006.

Votary Public

# BEFORE THE STATE OF NEW YORK PUBLIC SERVICE COMMISSION

--X

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

Case 06-W-\_\_\_\_

# **VERIFICATION**

) )ss:.

STATE OF NEW JERSEY

COUNTY OF CAMDEN

Jens Gemmecke, being duly sworn, deposes and states as follows:

1. I am counsel for Thames Water Aqua Holdings GmbH ("Thames GmbH").

2. I am authorized to sign this verification on behalf of Thames GmbH.

3. I have reviewed the foregoing Joint Petition and the statements of fact contained therein are true and correct to the best of my knowledge, information and belief.

Jens Gemmecke

Sworn to and subscribed before me this 20th day of April, 2006.

Votary Public

# EXHIBIT LIST

5.

Exhibit	Document
A	Current and Contemplated Organization Charts
В	Copy of certified excerpt from the Commercial Register of the Local Court of the City of Essen on the registration of Thames GmbH
С	Certified true and correct copy of the Certificate of Incorporation of Thames Water Aqua US Holding, Inc.
D	Certified true and correct copy of Restated Certificate of Incorporation of American Water Works Company, Inc.
E	Statement of Federal and State Authorities from which Approval Must be Obtained Before the Proposed Transaction may be Consummated
F	Copy of draft Short Environmental Assessment Form, with Attachment
G	Draft State Administrative Procedure Act Notice

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Exhibit A - Page 1 -

# Current Relationships among the Joint Petitioners



Exhibit A - Page 2 -

# Contemplated Organization Chart following consummation of the Proposed Transaction

publicly traded shares of common stock intended to be listed on the New York Stock Exchange

American Water Works Company, Inc. ("American Water") Long Island Water Corporation ("Long Island Water")

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Exhibit B

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- Translation from the German, page 1 -

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Commercial Register B of the District Court of Essen				Official p	rintout	Company number: H	RB 14447
		->This pri	ntout is not signe	ed and has the status of a ce	rtified copy<-		iges
	No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes
	1	2	3	4	5	6	1
	1	<ul> <li>a) <u>GBV Gesellschaft für</u> <u>Beteiligungsverwaltung mbH</u></li> <li>b) Essen</li> <li>c) The acquisition and the administration of shares in companies in Germany and abroad.</li> </ul>	EUR 50.000.00	<ul> <li>a) If only one managing director has been appointed, he shall represent the company alone. If more than one managing director has been appointed, the company will be represented by two managing directors or by one managing director acting jointly with an authorised signatory.</li> <li>By resolution of the Shareholders' Meeting, managing directors can also be granted power to represent the company alone.</li> <li>Managing directors can also be granted by a resolution of the Shareholders' Meeting the right to carry out on behalf of the company legal acts with himself in his own name or as representative of a third party.</li> <li>b) Managing director: Dr. Klaus Sturany, Dortmund, DOB 23.10.1946 <u>Managing director: Dr. Richard Klein, DOB 23</u> November 1943</li> </ul>		a) Gesellschaft mit beschränkter Haftung (limited liability company under German law) Articles of Association of 12 September 2000	a) 6 October 2000 xxx b) Articles of Association, sheet 10 – 14 Special volume Day of first entry: 21 September 2000 This page was transcribed for continuation by electronic data processing and replaced the former register sheet Approved 6 October 2000
	2	-		· · · · ·	Joint statutory signing authority together with one managing director or another officer with statutory signing authority. <u>Werner Böttcher, economist,</u> <u>Duisburg, DOB 24.06.1955</u> Dr. rer. pol. Daniel Koths, Duisburg, <u>DOB 15.11.1946</u> <u>Dr. jur. Georg Müller, Monheim,</u> DOB 23.02.1963		a) 25 October 2000 Werner

Commercial Register B of the District Court of Essen			Official printout Request of 29 December 2005, 2:46 p.m.		Company number: I m. Page 2 of 4 p	1RB 14447 ages
<b>.</b>	->This p	rintout is not signe	d and has the status of a ce	rtified copy<-	ů i	0
No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes
1	2	3	4	5	6	7

3 <u>EUR 500 million</u> (a)	
By a resolution of the Shareholders' Meeting of 17 Nover	ber 2000
14 November 2000, the capital stock was Bacht	
increased by EUR 499,950,000 from EUR	
50,000 to EUR 500 million and section 4 of	
the Articles amended accordingly.	
4 EUR 501 million b) The Shareholders' Meeting resolved on 25 a)	-
June 2001 to increase the capital stock by 6 July 20	Л
EUR 1,000,000,- from EUR 500 million to Bacht	
EUR 501 million with a view to performing a	
spin-off for incorporating the "Wasser" division	
from the assets of RWE Umwelt	
Aktiengesellschaft, Essen, and to amend	
section 4 of the Articles accordingly.	
5 b) On the basis of the spin-off agreement of 25 a)	
June 2001 and the approval resolution of the 6 July 20	J1
Shareholders' Meeting of RWE Umwelt Bacht	
Aktiengesellschaft, Essen, and the approval	
resolution of the Shareholders' Meeting of the	
company of the same date, RWE Umwelt	
Aktiengesellschaft, Essen, by way of a spin-off	
for incorporating as part of its assets in	
accordance with section 123, sub-section 2,	
number 1 UmwG, transferred to the company	
the "Wasser" division with all rights and	
obligations in its entirety in accordance with	
the said spin-off and transfer agreement.	
The spin-off comes into force only when	
entered in the register at the place of domicile	
of the transferring entity.	ļ
A control and profit-distribution agreement	1
concluded on 28 February 2001 with RWE	ļ
Aktiengesellschaft, Essen, as controlling	1
enterprise is in force, which was approved by	
the Shareholders' Meeting of the company by	
its ruling of 28 February 2001 and the	
Shareholders' Meeting of RWE Umwelt	
Aktiennesellechaft of 7 June 2001	

Comm	ercial Register B of the District Cou	irt of Essen	Official p Request of	rintout of 29 December 2005, 2:46 p.r	Company number: H n. Page 3 of 4 pa	RB 14447 Iges				
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No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes				
1	2	3	4	5	6	7				
6					b) The Shareholders' Meeting resolved on 25 June 2001 to increase the capital stock by EUR 1 million from EUR 500 million to EUR 501 million with a view to performing a spin- off for incorporating the "Wasser" division from the assets of RWE Umwelt Aktiengesellschaft, Essen, and to amend section 4 of the Articles accordingly.	a) 16 July 2001 Schulz b) The amount of capital increase should read EUR 1 million. (number 4, column 6a) marked in red accordingly. Entered as official				
7					b) The spin-off came into force with entry in the register sheet of the transferring entity on 19 July 2001.	act. a) 20 July 2001 Wemer				
8	a) Thames Water Aqua Holdings GmbH				a) The Shareholders' Meeting of 9 August 2001 resolved to change the name of the company and to amend section 1, sub- section 1 of the Articles accordingly.	a) 14 August 2001 Bacht				
9			b) <u>Appointed managing director:</u> <u>Bill Alexander, Henley-on-</u> <u>Thames (GB), DOB: 15</u> <u>February 1947</u>			a) 14 November 2001 Blöcker				
10				Statutory signing authority cancelled: Werner Böttcher, economist, Duisburg, DOB 24.06.1955		3 May 2002 Blöcker				
11			b) <u>No longer managing director:</u> <u>Dr. Richard Klein, DOB 23</u> <u>November 1943</u> Appointed managing director: Jan Zilius, Essen, DOB: 20 March 1946			a) 31 March 2003 Wyczisk				

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Commercial Register B of the District Court of Essen			Official printout		Company number: HRB 14447	
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No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes
1	2	3	4	5	6	7
12				Statutory signing authority cancelled: Dr. jur, Georg Müller, Monheim- Baumberg, DOB 23.02.1963 Joint statutory signing authority together with one managing director or another officer with statutory signing authority: Dr. Jens Hüffer, Düsseldorf, DOB:	a) The Shareholders' Meeting resolved on 30 June 2003 to amend section 9 (Annual financial statement and use of profit) of the Articles.	a) 5 August 2003 Moritz 10 October 2003 Werner
14			b) No longer managing director: Bill Alexander, Henley-on- Thames (GB), DOB: 15 February 1947	20 July 1303		a) 15 December 2005 Werner
15	5 M				a) The Shareholders' Meeting resolved on 19 December 2005 to amend section 3, sub- section 3 (Announcements). of the Articles	a) 29 December 2005 Vrenegor

Essen, 29 December 2005 The printout certifies the contents of the Commercial Register. Vrenegor, Clerk of the Court, Certifying Officer of the Record Office

[stamp of the District Court of Essen]

Handelsregister B des Amtsgerichts Essen

#### Amtlicher Ausdruck Abruf vom 29.12.2005 14:50

Nummer der Firma: Seite 1 von 4

#### HRB 14447

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ł	1	2	3	4	5	6	· 7
	1	a) <u>GBV Gesellschaft für</u> <u>Beteiligungsverwaltung mbH</u> b) Essen c) Der Erwerb und die Verwaltung von Beteiligungen an Unternehmen im In- und Ausland.	<u>50.000,00</u> <u>EUR</u>	a) a) Ist nur ein Geschäftsführer bestellt, so vertritt er die Gesellschaft allein. Sind mehrere Geschäftsführer bestellt, so wird die Gesellschaft durch zwei Geschäftsführer oder durch einen Geschäftsführer gemeinsam mit einem Prokuristen vertreten. Durch Beschluss der Gesellschafterversammlung kann Geschäftsführern Einzetvertretungsbefugnis erteilt werden, Auch können Geschäftsführern durch Gesellschafterbeschluss ermächtigt werden, die Gesellschaft bei der Vornahme von Rechtsgeschäften mit sich im eigenen Namen oder als Vertreter eines Dritten uneingeschränkt zu vertreten. b) Geschäftsführer: Dr. Sturany, Klaus, *23,10.1946 <u>Geschäftsführer:</u> Dr. Klein, Richard, *23,11.1943		a) Gesellschaft mit beschränkter Haftung Gesellschaftsvertrag vom 12. September 2000.	a) ob. 10.2000 Nakti b) Gesellschaftsvertrag Blatt 10 - 14 Sonderband. Tag der ersten Eintragung: 21.09.2000 Dieses Btatt ist zur Fortführung auf EDV umgeschrleben worden und dabei an die Stelle des bisherigen Registerblattes getreten. Freigegeben am 06.10.2000.
	2				Gesamtprokura gemeinsam mit einem Geschäftsführer oder einem anderen Prokurtsten. <u>DiplOkonom Böttcher, Werner, Duisburg,</u> *24.06.1955 Dr. rer. pol. Koths, Daniel, Duisburg, *15.11.1946 <u>Dr. jur. Müller, Georg, Monheim,</u> *23.02.1963		a) 25.10.2000 Werner
	3		<u>500.000.000</u> ,00 EUR	· .		b) Durch Beschluß der Gesellschafterversammlung vom 14. November 2000 wurde das Stammkapital von Euro 50.000, um Euro 499.950.000, auf Euro 500.000.000,00 erhöht und die Satzung entsprechend in § 4 geändert.	a) 17.11.2000 Bachi
	4		501.000.000			a)	a)

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Nummer der Eintragu ng	a) Firma b) Sitz, Niederlassung, Zweigniederlassungen c) Gegenstand des Unternehmens	Grund- oder Stammkapi tal	a) Allgemeine Vertretungsregelung b) Vorstand, persönlich haftender Gesellschafter, Geschäftsführer, Vertretungsberechtigte und besondere Vertretungsbefugnis	Prokura	a) Rechtsform, Beginn, Satzung oder Gesellschaftsvertrag b) Sonstige Rechtsverhältnisse	a) Tag der Eintragung b) Bemerkungen
1	2 .	3	4	5	6	7
		,00 EUR	87		Die Gesellschafterversammlung hat am 25. Juni 2001 beschlossen, das Stammkapital zum Zwecke der Durchführung der Abspaltung zur Aufnahme des Unternehmensbereichs "Wasser" aus dem Vermögen der RWE Umwelt Aktiengesellschaft, Essen, von EUR 500.000.000,00 um EUR 1.000.000.000,- auf EUR 501.000.000,00 zu erhöhen und den Gesellschaftsvertrag entsprechend in § 4 zu ändem.	06.07.2001 Bacht
5					b) Die RWE Umwelt Aktiengesellschaft, Essen, hat durch Abspaltungsvertrag vom 25. Juni 2001 und aufgrund des Zustimmungsbeschlusses der Hauptversammlung der RWE Umwelt Aktiengesellschaft, Essen, und des Zustimmungsbeschlusses der Gesellschafterversammlung der Gesellschaft vom gleichen Tag im Wege der Abspaltung zur Aufnahme gemäß § 123 Abs. 2 Nr. 1 UmwG als Teil ihres Vermögens den Unternehmensbereich Wasser mit allen Rechten und Pflichten als Gesamtheil nach näherer Maßgabe des oben genannten Abspaltungs- und Übernahmevertrages auf die Gesellschaft übertragen. Die Spaltung wird erst mit der Eintragung Im Register des Sitzes des übertragenden Rechtsträgers wirksam. Es besteht ein am 28.02.2001 geschlossener Beherrschungs- und Gewinnabführungsvertrag mit der RWE Aktiengesellschaft, Essen, als herrschendern Unternehmen, dem die Gesellschafterversammlung der Gesellschaft durch Beschluss vom 28.02.2001 und die Hauptversammlung der RWE Umwell Aktiengesellschaft am 07. Juni 2001 zugestimmt haben.	a) 10.07.2001 Bacht
6					a) Die Gesellschafterversammlung hat am 25. Juni 2001 beschlossen, das Stammkapital zum Zwecke der Durchführung der Abspaltung zur Aufnahme des Unternehmensbereichs "Wasser" aus dem Vermögen der RWE Umwelt Aktiengesellschaft,	a) 16.07.2001 Schulz b) Der

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andelsregister B des Amtsgerichts Essen

#### Amtlicher Ausdruck Abruf vom 29.12.2005 14:50

Nummer der Firma: Seite 3 von 4

HRB 14447

->Dieser Ausdruck wird nicht unterschrieben und gilt als beglaubigte Abschrift<-

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Nummer der Eintragu ng	a) Firma b) Sitz, Niederlassung, Zweignlederlassungen c) Gegenstand des Unternehmens	Grund- oder Stammkapi tal	a) Allgemeine Vertretungsregelung b) Vorstand, persönlich haftender Gesellschafter, Geschäftsführer, Vertretungsberechtigte und besondere Vertretungsbefugnis	Prokura ·	a) Rechtsform, Beginn, Satzung oder Gesellschaftsvertrag b) Sonstige Rechtsverhältnisse	a) Tag der Eintragung b) Bemerkungen
1	2	3	4	55	6	7
					Essen, von EUR 500.000.000,00 um EUR 1.000.000,- - auf EUR 501.000.000,00 zu erhöhen und den Gesellschaftsvertrag enisprechend in § 4 zu ändern.	Kapitalerhöhungsbetr ag beträgt richtig: 1.000.000, EUR. (Ifd. Nr. 4 Sp. 6 a) entsprechend gerötet. Von Amts wegen eingetragen.
7					b) Die Abspaltung ist mit der Eintragung auf dem Registerblatt des übertragenden Rechtsträgers am 19.07.2001 wirksam geworden.	a) 20.07.2001 Werner
8	a) Thames Water Aqua Holdings GmbH				a) Die Gesellschafterversammlung vom 9. August 2001 hat beschlossen, die Firma des Unternehmens und entsprechend den Gesellschaftsvertrag in § 1 Abs. 1 zu ändem.	a) 14.08.2001 Bacht
9			b) <u>Bestellt zum</u> <u>Geschäftsführer:</u> <u>Alexander, Bill, Henley-on-Thames (GB),</u> *15.02.1947			a) 14.11.2001 Blöcker
10				Prokura erloschen: DiplÖkonom Böttcher, Werner, Duisburg, *24.06.1955		03.05.2002 Blöcker
11			b) <u>Nicht mehr</u> <u>Geschäftsführer:</u> <u>Dr. Klein, Richard, *23.11.1943</u> Bestellt zum Geschäftsführer: Zilius, Jan, Essen, *20.04.1946			a) 31.03.2003 Wyczisk
12					a) Die Gesellschafterversammlung hat am 30. Juli 2003 beschlossen, den Gesellschaftsvertrag in § 9 (Jahresabschluss und Ergebnisverwendung) zu ändern.	a) 05.08.2003 Moritz

Adelsregister B des Amtsgerichts Essen

#### Amtlicher Ausdruck Abruf vom 29.12.2005 14:50

Nummer der Firma: Seite 4 von 4

### HRB 14447

->Dieser Ausdruck wird nicht unterschrieben und gilt als beglaubigte Abschrift<-

Nummer der Eintragu ng	a) Firma b) Sitz, Niederlassung, Zweignlederlassungen c) Gegenstand des Unternehmens	Grund- oder Stammkapi tal	a) Allgemeine Vertretungsregelung b) Vorstand, persönlich haftender Gesellschafter, Geschäftsführer, Vertretungsberechtigte und besondere Vertretungsbefugnis	Prokura	a) Rechtsform, Beginn, Satzung oder Gesellschaftsvertrag b) Sonstige Rechtsverhältnisse	a) Tag der Eintragung b) Bemerkungen
1	2	3	4	5	6	7
13				Prokura erloschen: Dr. jur, Müller, Georg, Monheim-		10.10.2003 Wemer
				Baumberg, *23.02.1963 Gesamtprokura gemeinsam mit einem Geschäftsführer oder einem anderen Prokuristen: Dr. Hüffer, Jens, Düsseldorf, *20.07.1965		
14			b) <u>Nicht mehr</u> <u>Geschäftsführer.</u> <u>Alexander, Blit, Henley-on-Thames (GB),</u> <u>*15.02.1947</u>			a) 15.12.2005 Werner
15			E		a) Die Gesellschafterversammlung hat am 19. Dezember 2005 beschlossen, den Gesellschaftsvertrag in § 3 Abs. 3 (Bekanntmachungen) zu ändern.	a) 29.12.2005 Vrenegor

Essen, 29.12.2005 Der Ausdruck bezeugt den Inhalt des Handelsregisters Vrenegor, Justizangestellte Urkundsbeamter der Geschäftsstelle

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Exhibit C

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Delaware

PAGE 1

# The First State

I, HARRIET SMITH WINDSOR, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF INCORPORATION OF "THAMES WATER AQUA US HOLDINGS, INC.", FILED IN THIS OFFICE ON THE TWENTY-SIXTH DAY OF JULY, A.D. 2002, AT 2:45 O'CLOCK P.M.



3552170 8100 060349568

Harriet Smith Windsor, Secretary of State AUTHENTICATION: 4668033

DATE: 04-13-06

STATE OF DELAWARE SECRETARY OF STATE DIVISION OF CORPORATIONSP.02 FILED 02:45 PM 07/26/2002 020478869 - 3552170

#### JUL-26-2002 13:01

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#### CERTIFICATE OF INCORPORATION

#### OF

#### THAMES WATER AQUA US HOLDINGS, INC.

#### ARTICLE I

#### Name

# The name of the corporation (which is hereinafter referred to as the "Corporation") is:

Thames Water Aqua US Holdings, Inc.

#### ARTICLE II

#### Registered Office and Registered Agent

The address of the Corporation's registered office in the State of Delaware is c/o The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, City of Wilmington, County of New Castle, Delaware 19801. The name and address of the registered agent for service of process on the Corporation is The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, City of Wilmington, County of New Castle, Delaware 19801.

#### ARTICLE III

#### Business or Purposes to be Conducted or Promoted

The purpose for which the Corporation is organized is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

#### ARTICLE IV

#### Capital Stock

The total number of shares of stock that the Corporation shall have authority to issue is 1000 shares of Common Stock, par value of \$1.00 per share.

<\*NYCORP-2151444.1:4411A:07/26/02-12:33p>>

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#### ARTICLE V

#### Incorporator

The name and mailing address of the incorporator is Arthur McMahon, III, Cravath, Swaine & Moore, Worldwide Plaza, 825 8th Avenue, New York, New York, 10019.

# ARTICLE VI

# Business and Affairs of the Corporation

For the management of the business and for the conduct of the affairs of the Corporation, and in further definition, limitation and regulation of the powers of the Corporation and of its directors and stockholders, it is further provided that:

(a) the number of directors of the Corporation shall be fixed by, or in the manner provided in, the By-laws of the Corporation;

(b) in furtherance and not in limitation of the powers conferred by the laws of the State of Delaware, the Board of Directors is expressly authorized and empowered to make, alter, amend or repeal any by-law of the Corporation;

(c) in addition to the powers and authorities herein or by statute expressly conferred upon it, the Board of Directors may exercise all such powers and do all such things and acts as may be exercised or done by the Corporation, subject, nevertheless, to the provisions of the laws of the State of Delaware, of this Certificate of Incorporation and of the By-laws of the Corporation; and

(d) unless and except to the extent that the Bylaws of the Corporation so require, the election of directors of the Corporation need not be by written ballot.

#### ARTICLE VII

#### Indemnification

(a) To the fullest extent that the General Corporation Law of the State of Delaware as it exists on the date hereof or as it may be hereafter amended permits the limitation or elimination of the liability of directors, no director of the Corporation shall be liable to the

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Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director. No amendment to or repeal of this Article shall apply to or have any effect on the liability or alleged liability of any director of the Corporation for or with respect to any acts or omissions of such director occurring prior to such amendment or repeal.

(b) In addition to any requirements of law and any other provision herein or in the terms of any class or series of capital stock having a preference over the common stock of the Corporation as to dividends or upon liquidation (and notwithstanding that a lesser percentage may be specified by law), the affirmative vote of the holders of 80% or more of the voting power of the then outstanding voting stock of the Corporation, voting together as a single class, shall be required to amend, alter or repeal any provision of this Article.

IN WITNESS WHEREOF, I, Arthur McMahon, III, the Sole Incorporator of Thames Water Aqua US Holdings, Inc. have executed this Certificate of Incorporation this 26th day of July, 2002, and DO HEREBY CERTIFY under the penalties of perjury that this instrument is my act and deed and that the facts stated herein are true.

Arthur McMahon, III Incorporator

Incorporator Mailing Address:

Cravath, Swaine & Moore Worldwide Plaza 825 8th Avenue New York, New York 10019

<<pre><<pre>NYCORP-2151444.2:4411A:07/26/02-12:330>>

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PAGE 1

The First State

I, HARRIET SMITH WINDSOR, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE RESTATED CERTIFICATE OF "AMERICAN WATER WORKS COMPANY, INC.", FILED IN THIS OFFICE ON THE TWENTIETH DAY OF JUNE, A.D. 2003, AT 2:41 O'CLOCK P.M.



0352210 8100 0603**4**9559 AUTHENTICATION: 4668022

Harriet Smith Windsor, Secretary of State

DATE: 04-13-06

State of Delaware Secretary of State Division of Corporations Delivered 02:43 PM 06/20/2003 FILED 02:41 PM 06/20/2003 SRV 030409293 - 0352210 FILE

### RESTATED

### CERTIFICATE OF INCORPORATION

### OF

### AMERICAN WATER WORKS COMPANY, INC.

American Water Works Company, Inc., a corporation organized under the laws of the State of Delaware (the "Corporation"), hereby certifies as follows:

A. The name of the Corporation is American Water Works Company, Inc. The Corporation was originally incorporated under the name American Communities Company, and the original Certificate of Incorporation of the Corporation was filed with the Secretary of State of the State of Delaware on August 28, 1936.

B. This Restated Certificate of Incorporation, which amends the provisions of the Corporation's Certificate of Incorporation as heretofore amended, restated and supplemented, was duly adopted by the Board of Directors of the Corporation and by the sole stockholder of the Corporation in accordance with the provisions of Sections 228, 242 and 245 of the General Corporation Law of the State of Delaware.

C. The text of the Certificate of Incorporation of the Corporation, as heretoforc amended, restated and supplemented, is hereby amended and restated to read in its entirety as follows:

#### ARTICLE I

The name of the corporation (hereinafter called the "Corporation") is American Water Works Company, Inc.

#### ARTICLE II

The address of the Corporation's registered office in the State of Delaware is 1209 Orange Street, in the City of Wilmington, County of New Castle, Delaware 19801. The name of the Corporation's registered agent at such address is The Corporation Trust Company.

#### ARTICLE III

The purpose of the Corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

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## ARTICLE IV

A. Authorized Capital Stock. The total number of shares of all classes of stock that the Corporation shall have authority to issue is 2,750 shares, consisting of (i) 1,000 shares of common stock having the par value of 1.00 per share (the "Common Stock") and (ii) 1,750 shares of preferred stock having no par value (the "Preferred Stock").

B. <u>Preferred Stock</u>. The powers, preferences and rights and the qualifications, limitations and restrictions of the Preferred Stock are as follows:

Dividends. The holders of the outstanding shares of Preferred Stock shall 1 be entitled to receive, when, as and if declared by the Board of Directors of the Corporation, out of the assets of the Corporation legally available therefor, cumulative preferential dividends at a rate equal to 5.9% per annum (the "Dividend Rate") of the Liquidation Preference (as defined below) of such shares, payable in each quarterly in arrears commencing on September 15, 2003. Dividends shall begin to accrue and be cumulative on outstanding shares of Preferred Stock from the date of issuance of such shares. If the full amount of accrued dividends, whether or not declared, is not paid on a Dividend Payment Date (as defined below), then interest shall accrue on any unpaid amounts at a rate equal to the Dividend Rate until such amounts are paid in full. No dividend may be paid on the Common Stock unless all outstanding dividends then owed on the Preferred Stock have been paid in full. As used herein, "Dividend Payment Date" shall mean March 15, June 15, September 15 and December 15 of each year; provided, however, that if any such day is not a day on which commercial banks are open for general business in the City of New York (a "Business Day"), then the Dividend Payment Date shall be the Business Day immediately preceding such day. The holders of shares of Preferred Stock shall not be entitled to any dividends or other distributions in respect of the Preferred Stock except as provided berein.

2. Voting Rights.

(a) Except as otherwise expressly required under Delaware law or provided in this Restated Certificate of Incorporation, the holders of the outstanding shares of Preferred Stock shall not be entitled to vote on any matter required or permitted to be voted on by the stockholders of the Corporation.

(b) Notwithstanding paragraph (a) of this Section 2, so long as any shares of Preferred Stock are issued and outstanding, the Corporation shall not, without the aftirmative vote or consent of the holders of two-thirds of the shares of Preferred Stock at the time outstanding voting as a separate class, alter or change any of the powers, preferences or special rights of the shares of Preferred Stock so as to affect them adversely.

(c) Notwithstanding paragraph (a) of this Section 2, if dividends on the shares of Preferred Stock outstanding are unpaid and in arrears for six consecutive months or more, thereafter and until all accrued and unpaid dividends, whether or not declared, on the shares of Preferred Stock outstanding shall have been paid in full, each share of Preferred Stock

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shall entitle the holder thereof to one (1) vote on all matters submitted to a vote of the

3. Liquidation Preference.

stockholders of the Corporation.

In the event of any liquidation, dissolution or winding up of the Corporation, whether voluntary or involuntary (a "Liquidation Event"), the holders of the outstanding shares of Preferred Stock shall be entitled to receive out of the assets of the Corporation available for distribution to its stockholders, prior and in preference to any distribution of any of the assets of the Corporation to the holders of Common Stock, the amount in cash equal to the sum of \$1,000,000 per share (the "Liquidation Preference") plus an amount in cash equal to all accrued and unpaid dividends thereon, whether or not declared, to the date fixed for liquidation, dissolution or winding up (such sum, the "Aggregate Liquidation Amount"). If, upon the occurrence of a Liquidation Event, the assets of the Corporation shall be insufficient to permit the payment to the holders of the Preferred Stock the full Aggregate Liquidation Amount, then the entire assets of the Corporation, or the proceeds thereof, legally available for distribution shall be distributed ratably among the holders of the Preferred Stock on the basis of the number of shares of Preferred Stock held by each. After payment in full in cash of the Aggregate Liquidation Amount, the holders of shares of Preferred Stock will not be entitled to any further participation in any distribution of assets of the Corporation.

As used herein, a Liquidation Event shall include any consolidation, merger, or reorganization pursuant to which Permitted Persons do not continue to hold at least a majority of the voting power of the Common Stock after such event. In addition, a sale, transfer or other disposition of all or substantially all of the Corporation's assets shall be deemed to be a Liquidation Event for purposes of this Restated Certificate of Incorporation. As used herein, "Permitted Persons" shall mean RWF. Aktiengesellschaft and any corporation, limited liability company, association or other entity of which securities or other equity interests representing more than 50% of the equity and more than 50% of the ordinary voting power are directly or indirectly held by RWE Aktiengesellschaft.

4. Redemption. The shares of Preferred Stock shall not be redeemable.

5. <u>Conversion</u>. No holder of shares of Preferred Stock shall have the right or option, at any time, to convert its shares of Preferred Stock into shares of Common Stock.

C <u>Common Stock</u>. The powers and rights and the qualifications, limitations and restrictions of the Common Stock are as follows:

1. <u>Dividends</u>. Subject to the prior rights of holders of outstanding shares of Preferred Stock, the holders of the outstanding shares of Common Stock shall be entitled to receive when, as and if declared by the Board of Directors, out of the assets of the Corporation legally available therefor, such dividends as may be declared from time to time by the Board of Directors.

2. <u>Voting Rights</u>. Each outstanding share of Common Stock shall entitle the holder thereof to fifty (50) votes on all matters submitted to a vote of the stockholders of the Corporation.

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3. Liquidation Rights. In the event of any Liquidation Event, after there shall have been paid in cash to the holders of the outstanding shares of Preferred Stock the full Aggregate Liquidation Amount, the holders of the outstanding shares of Common Stock shall be entitled to receive ratably all of the remaining assets of the Corporation available for distribution to its stockholders.

4. <u>Redemption</u>. The shares of Common Stock shall not be redeemable.

### ARTICLE V

The number of directors of the Corporation shall be fixed from time to time by the Board of Directors of the Corporation.

#### ARTICLE VI

In furtherance and not in limitation of the powers conferred upon it by law, the Board of Directors of the Corporation is expressly authorized to adopt, amend or repeal the Bylaws of the Corporation.

#### ARTICLE VII

Unless and except to the extent that the By-laws of the Corporation so require, the election of directors of the Corporation need not be by written ballot.

### ARTICLE VIII

A director of the Corporation shall not, in the absence of fraud, be disqualified by his office from dealing or contracting with the Corporation either as vendor, purchaser or otherwise, nor in the absence of fraud, shall any contract or other transaction of the Corporation be affected or invalidated in any way by the fact that any of the directors of the Corporation are in any way interested in or connected with any other party to such contract or transaction or are themselves parties to such contract or transaction; provided, however, that such interest and connection either shall be fully disclosed to a meeting of the Board of Directors, or of a committee thereof having authority in the premises, at which such contract or transaction is authorized, confirmed or approved, or shall at the time be otherwise known to the directors present at such meeting, and provided further that there shall be present at the meeting of the Board of Directors, or such committee, authorizing, confirming or approving such contract or transaction, and such contract or transaction shall be authorized, confirmed or approved by the vote of, directors not so interested or connected constituting a majority of the directors then in office No director of the Corporation shall be liable to the Corporation or to any stockholder or cteditor thereof or to any other person, for any loss incurred under or by reason of any contract or transaction of the Corporation, and no such director shall be accountable for any gains or profits realized therefrom. provided, however, that any such contract or transaction shall, at the time it was entered into, have been a reasonable one to have been entered into and shall have been upon torms that at the time were fair, and provided further that, if such director shall have

been so interested or connected as to such contract or transaction, such contract or transaction shall have been authorized, confirmed or approved as aforesaid after the disclosure or knowledge of such interest or connection as aforesaid. A director of the Corporation shall not be deemed interested in or connected with a party to a contract or transaction between the Corporation and a parent, subsidiary or affiliated corporation by reason of the fact that he is also a director, officer or stockholder of such parent, subsidiary or affiliated corporation.

### ARTICLEIX

No director of the Corporation shall be personally liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director, except for liability (i) for any breach of the director's duty of loyalty to the Corporation or its stockholders, (ii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) under Section 174 of the General Corporation Law of the State of Delaware, or (iv) for any transaction from which the director derived an improper personal benefit. Any repeal or modification of this Article by the stockholders of the Corporation shall be prospective only, and shall not affect, to the detriment of any director, any limitation on the personal liability of a director of the Corporation existing at the time of such repeal or modification.

### ARTICLE X

Each person who is or was or had agreed to become a director or officer of the Corporation, and each such person who is or was serving or who had agreed to serve at the request of the Corporation as a director, officer, partner, member, employee or agent of another corporation, partnership, limited liability company, joint venture, trust or other enterprise (including the heirs, executor, administrators or estate of such person), shall be indemnified by the Corporation to the fullest extent permitted from time to time by applicable law.

IN WITNESS WHEREOF; the Corporation has caused its corporate scal to be hereunto affixed and this certificate to be signed by Joseph F. Hannett, Jr., its Vice President and Treasurer and attested by W. Timothy Pohl, its Vice President, General Counsel and Secretary, on this 20th day of June, 2003.

American Water Works Company, Inc.

By

ce President and Treasurer

(Corperate Seal)

Attest: Byt W. Trmothy Pohl

Vice President General Counsel and Secretary





### Exhibit E

### Filings made or to be made with federal and state authorities

Fillings have or will be made with the following federal and state authorities before the proposed transaction can be consummated:

U.S. Securities and Exchange Commission

State of Delaware, Secretary of State

Arizona Corporation Commission<sup>1</sup>

California Public Utilities Commission

Hawaii Public Utilities Commission<sup>2</sup>

Illinois Commerce Commission

Kentucky Public Service Commission

Maryland Public Service Commission

New Jersey Board of Public Utilities

New Mexico Public Regulation Commission

New York Public Service Commission

Pennsylvania Public Utility Commission

Tennessee Regulatory Authority

Virginia State Corporation Commission

West Virginia Public Service Commission

<sup>&</sup>lt;sup>1</sup> Joint Petitioners believe that the proposed transaction is not normally regulated by the Arizona Corporation Commission, but filing will be made in the alternative and listing herein is without prejudice to such position.

 $<sup>^2</sup>$  Joint Petitioners believe the proposed transaction is not subject to the jurisdiction of the Hawaii Public Utilities Commission, but filing will be made in the alternative and listing herein is without prejudice to such position.

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# Appendix C State Environmental Quality Review SHORT ENVIRONMENTAL ASSESSMENT FORM For UNLISTED ACTIONS Only

PART I - PROJECT INFORMATION (To be completed by	Applicant or Project Sponsor)
1. APPLICANT/SPONSOR	2. PROJECT NAME
Thames Water Aqua Holdings GmbH. Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation	See attachment.
3. PROJECT LOCATION:	
Municipality See attachment.	County Nassau County
4. PRECISE LOCATION (Street address and road intersections, promine	ant landmarks, etc., or provide map)
Long Island Water Corporation's service territory in the southw	estern area of Nassau County.
5. PROPOSED ACTION IS:	ation N/A
6. DESCRIBE PROJECT BRIEFLY:	
See attachment.	
7. AMOUNT OF LAND AFFECTED:	acres
	OTHER EXISTING LAND USE RESTRICTIONS?
8. WILL PROPOSED ACTION COMPLY WITH EXISTING ZORING ON	
9. WHAT IS PRESENT LAND USE IN VICINITY OF PROJECT?	Agriculture Park/Forest/Open Space Other
N/A	
·	
10. DOES ACTION INVOLVE A PERMIT APPROVAL, OR FUNDING,	, NOW OR ULTIMATELY FROM ANY OTHER GOVERNMENTAL AGENCY
(FEDERAL, STATE OR LOCAL)?	permit/approvals:
Public Service Commission	n Section 89-h Approval
	••
44 DOER ANY ASPECT OF THE ACTION HAVE A CURRENTLY VA	ALID PERMIT OR APPROVAL?
Ves No If Yes, list agency(s) name and	permit/approvals:
N/A	
42 AS A RESULT OF PROPOSED ACTION WILL EXISTING PERMI	IT/APPROVAL REQUIRE MODIFICATION?
Yes No N/A	·
I CERTIFY THAT THE INFORMATION PROVIDE Applicant/sponsor name: See response to Question 1 (above).	D ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE Date: 4/20/2006
$\hat{n}$	VP SEQUE DELUGEL LEDE DOLAND WATER CON
Signature: h ayour provyan	
If the action is in the Coastal Area, a	nd you are a state agency, complete the re proceeding with this assessment
	OVER



PART II - IMPACT ASSESSMENT (To be completed by Lead	d Agency)	
A. DOES ACTION EXCEED ANY TYPE I THRESHOLD IN 6 NYCRR, PART (	617.4? If yes, coordinate the review process and use the FULL EAF.	
B. WILL ACTION RECEIVE COORDINATED REVIEW AS PROVIDED FOR UNLISTED ACTIONS IN 6 NYCRR, PART 617.6? If No, a negative declaration may be superseded by another involved agency. Yes No		
C. COULD ACTION RESULT IN ANY ADVERSE EFFECTS ASSOCIATED W C1. Existing air quality, surface or groundwater quality or quantity, noise I potential for erosion, drainage or flooding problems? Explain briefly:	VITH THE FOLLOWING: (Answers may be handwritten, if legible) levels, existing traffic pattern, solid waste production or disposal,	
C2. Aesthetic, agricultural, archaeological, historic, or other natural or cul	lural resources; or community or neighborhood character? Explain briefly:	
C3. Vegetation or fauna, fish, shellfish or wildlife species, significant habi	tats, or threatened or endangered species? Explain briefly:	
C4. A community's existing plans or goals as officially adopted, or a change i	n use or intensity of use of land or other natural resources? Explain briefly:	
C5. Growth, subsequent development, or related activities likely to be ind	Juced by the proposed action? Explain briefly:	
C6. Long term, short term, cumulative, or other effects not identified in C	1-C5? Explain briefly:	
C7. Other impacts (including changes in use of either quantity or type of	energy)? Explain briefly:	
D. WILL THE PROJECT HAVE AN IMPACT ON THE ENVIRONMENTAL CH ENVIRONMENTAL AREA (CEA)? Yes No If Yes, explain briefly:	IARACTERISTICS THAT CAUSED THE ESTABLISHMENT OF A CRITICAL	
E. IS THERE, OR IS THERE LIKELY TO BE, CONTROVERSY RELATED TO Yes No If Yes, explain briefly:	D POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS?	
PART III - DETERMINATION OF SIGNIFICANCE (To be completed by Agency) INSTRUCTIONS: For each adverse effect identified above, determine whether it is substantial, large, important or otherwise significant. Each effect should be assessed in connection with its (a) setting (i.e. urban or rural); (b) probability of occurring; (c) duration; (d) irreversibility; (e) geographic scope; and (f) magnitude. If necessary, add attachments or reference supporting materials. Ensure that explanations contair sufficient detail to show that all relevant adverse impacts have been identified and adequately addressed. If question D of Part II was checked yes, the determination of significance must evaluate the potential impact of the proposed action on the environmental characteristics of the CEA		
Check this box if you have identified one or more potentially large or s EAF and/or prepare a positive declaration.	significant adverse impacts which MAY occur. Then proceed directly to the FULL	
Check this box if you have determined, based on the information and analysis above and any supporting documentation, that the proposed action WILL NOT result in any significant adverse environmental impacts AND provide, on attachments as necessary, the reasons supporting this determination		
Name of Lead Agency	4/20/2006	
Biol of Tune Name of Responsible Officer in Lead Agency	Title of Responsible Officer	
Print of Type Name of Responsible Onicer in Lead Agency	Disastus of Proposor //f different from reconstible officer)	
Signature of Responsible Officer in Lead Agency	Signature of Freparer (in uncreate non responsible officer)	

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#### NEW YORK PUBLIC SERVICE COMMISSION

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval Of The Merger of Thames Water Aqua US Holdings, Inc. With And Into American Water Works Company, Inc. and The Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

Case 06-W-\_\_\_\_

### ATTACHMENT TO SHORT ENVIRONMENTAL ASSESSMENT FORM

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#### OF

### THAMES WATER AQUA HOLDINGS GMBH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION

#### I. Introduction

The action at issue is the proposed (i) sale by Thames Water Aqua Holdings GmbH ("Thames GmbH") of up to 100% of the shares of common stock of American Water Works Company, Inc. ("American Water") in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of Thames Water Aqua US Holdings, Inc. ("TWAUSHI") with and into American Water, with American Water being the surviving corporation. As a result of this proposed transaction, American Water would become a publicly-owned utility holding company. There will be no impact to the outstanding common stock of Long Island Water Corporation ("Long Island Water"), which is currently owned by American Water and will continue to be owned by American Water after closing of the proposed transaction.

#### II. Background

Thames GmbH is a foreign corporation organized and existing under the laws of the Federal Republic of Germany. Thames GmbH's principal office is located at Opernplatz 1, 45128 Essen, Federal Republic of Germany. It is a wholly-owned subsidiary of RWE Aktiengesellschaft ("RWE"). Thames GmbH is the holding company for most of RWE's water operations, both in the United States and in several foreign countries.

TWAUSHI is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ

08043. TWAUSHI is a wholly-owned subsidiary of Thames GmbH. In turn, TWAUSHI is the direct parent company of American Water. TWAUSHI's subsidiaries now have approximately 7,000 employees and provide water, wastewater and other water resource management services to approximately 18 million customers in 29 states and Canada.

American Water is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ 08043. American Water owns regulated operating subsidiaries in 18 states. American Water does not conduct business in New York, nor is it authorized to do so.

Long Island Water is a wholly-owned subsidiary of American Water. It is a regulated water-works corporation organized and existing under the laws of the State of New York, with its principal office located at 733 Sunrise Highway, Lynbrook, New York. Long Island Water serves approximately 74,500 customers in southwestern Nassau County, New York. Long Island Water currently owns, operates and maintains potable water production, treatment, storage, transmission and distribution systems for the purpose of furnishing potable water for residential, commercial, industrial and governmental users in its service territory.

Thames GmbH proposes to sell up to 100% of the shares of common stock of American Water. The shares will be sold through one (or more, if necessary) underwritten public offerings to a broad group of investors, including institutional and retail investors. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange.

As a result of this transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after the proposed transaction.

#### III. Conclusion

The sale of up to 100% of the shares of common stock of American Water and the merger of TWAUSHI with and into American Water, immediately prior to the closing of the initial public offering, will have no environmental impact. There are no proposed operational changes for Long Island Water, which will continue to operate in accordance with all permits and certificates. The action at issue is merely a change in corporate ownership and structure.



### (SAPA No.

# NYS DEPARTMENT OF STATE NOTICE OF PROPOSED RULE MAKING

### PUBLIC SERVICE COMMISSION

)

NOTE: Typing and submission instructions are at the end of this form. Please be sure to COMPLETE ALL ITEMS. Incomplete forms and nonscannable text attachments will be cause for rejection of this notice.

Pursuant to the provisions of the State Administrative Procedure Act, (SAPA), NOTICE is hereby given of the following agency action:

#### 1. Proposed action:

The Public Service Commission ("Commission") is considering whether to approve or reject, in whole or in part, a joint petition of Thames Water Aqua Holdings GmbH ("Thames GmbH"), Thames Water Aqua US Holdings, Inc. ("TWAUSHI"), American Water Works Company, Inc. ("American Water"), and Long Island Water Corporation ("Long Island Water") for approval of (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of TWAUSHI with and into American Water, with American Water being the surviving corporation. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange. As a result of the proposed transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after the proposed transaction.

2. Statutory authority under which rule is proposed: Public Service Law, Section 89-h.

3. Subject of rule: Sale of stock.

4. **Purpose of rule**: To approve the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and the merger of TWAUSHI with and into American Water, immediately prior to the closing of the initial public offering.

5. Terms of rule: (Check applicable box):

[] The rule contains 2,000 words or less. An original copy of the text in scannable format is attached to this form.

- [] The rule contains more than 2,000 words. Therefore, an original copy of a summary of the text (in scannable format) is attached to this form.
- [X] Pursuant to SAPA Section 202(7)(b), the agency elects to print a description of the subject, purpose and substance of the rule containing less than 2,000 words. The original text in scannable format is attached to this form.

6. The text of the rule, regulatory impact statement and regulatory flexibility analysis may be obtained from:

Jeffrey Mills, Clerk II Three Empire State Plaza Albany, New York 12223 (518) 474-3204

- 7. Regulatory impact statement (check applicable box):
  - [] A regulatory impact statement of 2,000 words or less is submitted with this notice.
  - [] A summary of the regulatory impact statement is submitted with this notice because the full text exceeds 2,000 words.
  - [] A consolidated regulatory impact statement is submitted with this notice because:
    - [] the rule is one of a series of closely related and simultaneously proposed rules.
    - [] the rule is one of a series of virtually identical ruled proposed during the same year.
  - [] A regulatory impact statement is not submitted with this notice because this action is a technical amendment and, therefore, exempt from SAPA Section 202-a. Attached to this notice is a statement of the reason(s) for claiming this exemption.
  - [] A regulatory impact statement is not submitted with this notice because this action is subject to a consolidated regulatory impact statement previously printed in the State Register under a notice of proposed rulemaking, ID No. <u>PSC-</u> Register date:\_\_\_\_\_.
  - [X] A regulatory impact statement is not submitted with this notice because this action is a "rate making" as defined in SAPA Section 102(2) (a) (ii).

8. Regulatory flexibility analysis (check applicable box):

[] A regulatory flexibility analysis of 2,000 words or less is submitted with this notice.

- [] A summary of the regulatory flexibility analysis is submitted with this notice because the full text exceeds 2,000 words.
- [] A regulatory flexibility analysis is not submitted with this notice because this action will not impose any adverse economic impact on small businesses and will not impose any reporting, recordkeeping or other compliance requirements on small businesses. A statement is attached setting forth this agency's finding and the reasons upon which the finding was made, including what measures were used by this agency to ascertain that this action will not impose such compliance requirements, or adverse economic impact on small businesses.
- [X] A regulatory flexibility analysis is not submitted with this notice because this action is a "rate making" as defined in SAPA Section 102(2) (a) (ii).
- [] A consolidated regulatory flexibility analysis is submitted with this notice because this action is the first of a series of closely related rules that will be subject to the same analysis.
- [] A regulatory flexibility analysis is not submitted because this action is subject to a consolidated regulatory flexibility analysis that was previously printed in the State Register under a notice of proposed rule making, ID No. <u>PSC-</u>; Register date: \_\_\_\_\_.
- 9. Expiration date: (check only if applicable):
  - [X] This proposal will not expire in 180 days because it is for a "rate making" as defined in SAPA Section 102(2) (a) (ii).

10. Public Hearings (check box and complete as applicable):

- [] A public hearing is required by law and will be held at \_\_\_\_a.m/p.m. on \_\_\_\_\_, 20\_\_\_, at\_\_\_\_\_\_
- [] A public hearing is not required by law, and has not been scheduled.
- [] A public hearing is not required by law, but will be held at:\_\_\_\_, a.m./p.m. on \_\_\_\_, 20\_\_, at \_\_\_\_\_

- 11. Interpreter Services (check only if a public hearing has been scheduled):
  - [] Interpreter services will be made available to deaf persons, at no charge, upon written request submitted within a reasonable time prior to the scheduled public hearing. Requests must be addressed to the agency contact designated in this notice.
- 12. Accessibility (check appropriate box only if a public hearing has been scheduled):
  - [] All public hearings have been scheduled at places reasonably accessible to persons with a mobility impairment.
  - [] All public hearings except the following have been scheduled at places reasonably accessible to persons with a mobility impairment:
    - 1.

- · · · ·

- 2.
- 3.
- [] None of the scheduled public hearing are at places that are reasonably accessible to persons with a mobility impairment.
- [] An optional explanation is being submitted regarding the nonaccessibility of one or more hearing sites.

13. Submit data, views or arguments to (complete only if different than previously named agency contact):

Hon. Jaclyn Brilling, Secretary Three Empire State Plaza Albany, New York 12223 (518) 474-6530

14. Additional matter required by statute:

[] Check box if not applicable.

- 15. Public comment will be received until:
  - [] 45 days after publication of this notice (MINIMUM public comment period).
  - [] 5 days after the last scheduled public hearing required by statute (MINIMUM, with required hearing).
  - [] Other: (specify) \_\_\_\_\_.

Agency Certification (To be completed by the person who PREPARED the notice).

I have reviewed this form and the information submitted with it. The information contained in this notice is correct to the best of my knowledge.

I have reviewed Article 2 of the State Administrative Procedure Act and Parts 260 through 263 of 19 NYCRR and I hereby certify that this notice complies with all applicable provisions.

Name	Signature
Address: Three Empire State Plaza	Date
Albany, NY 12223	Telephone

Please read before submitting this notice:

- 1. Except for this form itself, all text must be typed in scannable format as described in the Department of State's "NYS Register Procedures Manual."
- 2. Submit the original and six copies of this notice, properly collated: a) form; b) text or summary of rule; c) regulatory impact statement; and d) regulatory flexibility analysis.
- 3. This notice may be hand delivered or mailed:

a) Hand deliver or express mail to:

Register/NYCRR Unit, Department of State, 41 State St. (11th fl), Albany, NY (12207).

b) Address mail to:

Register/NYCRR Unit, Department of State, 162 Washington Avenue, Albany, NY 12231.

### Substance of Proposed Rule

The Public Service Commission ("Commission") is considering whether to approve or reject, in whole or in part, a joint petition of Thames Water Aqua Holdings GmbH ("Thames GmbH"), Thames Water Aqua US Holdings, Inc. ("TWAUSHI"), American Water Works Company, Inc. ("American Water"), and Long Island Water Corporation ("Long Island Water") (collectively, the "Joint Petitioners") for approval of (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of TWAUSHI with and into American Water, with American Water being the surviving corporation. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange. As a result of the proposed transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after closing of the proposed transaction. According to the Joint Petitioners, the proposed transaction is in the best interest of the public, as well as the customers and employees of Long Island Water. As a publicly-traded company, American Water will be in a better position to maintain, develop and grow the water and wastewater business of its subsidiaries, including that of Long Island Water. Long Island Water will benefit under the improved operations of its parent company and, consistent with this Commission's policy goal of consolidating small water systems, continue to consider the strategic acquisition of surrounding water systems. The proposed transaction will have no impact upon the financial condition of Long Island Water, which will continue to provide safe, adequate and reliable service at just and reasonable rates in fulfillment of its obligations under New York State and federal law.



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#### PENDING PETITION MEMO

#### Date: 4/24/2006

TO : Office of Gas & Water Office of Accounting & Finance Office of Hearings & Alternative Dispute Resolution Office of General Counsel

FROM: CENTRAL OPERATIONS

SUBJECT: 06-W-0490

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc. and Long Island Water corp. for approval of the Merger of Thames water Aqua US Holdings, Inc. with and into American Water Works Co., Inc. and the subsequent sale of the shares of the Common stock of American Water Works Co., Inc.

06 - 42 - 0490

# LEBOEUF, LAMB, GREENE & MACRAE LLP

NEW YORK WASHINGTON, D.C. ALBANY BOSTON CHICAGO HARTFORD HOUSTON JACKSONVILLE LOS ANGELES PITTSBURGH SAN FRANCISCO

99 WASHINGTON AVENUE SUITE 2020 ALBANY, NY 12210-2820

(518) 626-9000 FACSIMILE: (518) 626-9010 LONDON A MULTINERSHIP PARIS BRUSSELS JOHANNESBURG (PTY) LTD. MOSCOW AFFILIATED OFFICE BISHKEK ALMATY BEIJING

April 21, 2006

### **BY HAND DELIVERY**

Honorable Jaclyn A. Brilling Secretary New York State Public Service Commission Three Empire State Plaza Albany, New York 12223-1350

> Re: Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale of the Shares of the Common Stock of American Water Works Company, Inc.

Dear Secretary Brilling:

On behalf of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation, enclosed please find an original and five (5) copies of the Joint Petition for Approval of the Merger and the Subsequent Sale of the Shares of the Common Stock of American Water Works Company, Inc.

If you have any questions regarding this filing, please contact me.

Sincerely,

Dian J. Folgherald/clc

Brian T. FitzGerald

2006 APR 21 PM 3: 29 EXEC-FILES-ALBANY PUBLIC

BTF/cd (94748) Enclosures

cc: Michael Sgro

### **BEFORE THE STATE OF NEW YORK** PUBLIC SERVICE COMMISSION

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Joint Petition of Thames Water Aqua Holdings : GmbH, Thames Water Aqua US Holdings, Inc., : American Water Works Company, Inc. and Long : Island Water Corporation For Approval of the : Merger of Thames Water Aqua US Holdings, Inc. : With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc. :

Case 06-W-

# JOINT PETITION OF

THAMES WATER AQUA HOLDINGS GmbH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION FOR APPROVAL OF THE MERGER OF THAMES WATER AQUA US HOLDINGS, INC. WITH AND INTO AMERICAN WATER WORKS COMPANY, INC. AND THE SUBSEQUENT SALE OF THE SHARES OF THE COMMON STOCK OF AMERICAN WATER WORKS COMPANY, INC.

Frank J. Miller Brian T. FitzGerald

Of Counsel

LeBoeuf, Lamb, Greene & MacRae LLP 125 West 55<sup>th</sup> Street New York, New York 10019-5389 Tel: (212) 424-8000 Fax: (212) 424-8500

Dated: April 21, 2006

Michael A. Sgro Vice President, Secretary and General Counsel

Long Island Water Corporation American Water Northeast Region 131 Woodcrest Road Cherry Hill, New Jersey 08003 Tel: (856) 310-2210 Fax: (856) 310-2279

2006 APR 21 PM 3: 29

EXEC-FILES-ALBANY NOISSIMMOD PUBLIC SERVICE

JOINT PETITION OF THAMES WATER AQUA HOLDINGS GmbH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION FOR APPROVAL OF THE MERGER OF THAMES WATER AQUA US HOLDINGS, INC. WITH AND INTO AMERICAN WATER WORKS COMPANY, INC. AND THE SUBSEQUENT SALE OF THE SHARES OF THE COMMON STOCK OF AMERICAN WATER WORKS COMPANY, INC.

#### A. INTRODUCTION

1. Thames Water Aqua Holdings GmbH ("Thames GmbH"); Thames Water Aqua US Holdings, Inc. ("TWAUSHI"); American Water Works Company, Inc. ("American Water"); and Long Island Water Corporation ("Long Island Water") (hereinafter collectively referred to as "Joint Petitioners"), pursuant to Section 89-h of the New York State Public Service Law ("Section 89-h") and such other statutory and regulatory authority deemed appropriate,<sup>1</sup> hereby request that the New York State Public Service Commission ("Commission") approve (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of TWAUSHI with and into American Water, with American Water being the surviving corporation (the transactions set forth in (i) and (ii) are hereinafter collectively referred to as the "Proposed Transaction"). The offerings will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange. The Joint Petitioners submit that the Proposed Transaction is in the

<sup>&</sup>lt;sup>1</sup> TWAUSHI is a foreign corporation and American Water is a foreign holding company, neither of which is certified to provide utility service in New York. Accordingly, Joint Petitioners believe that the Commission need not approve the proposed merger. However, should the Commission assert jurisdiction, the Joint Petitioners hereby request that any required approvals be granted.

public interest and will result in the continuous and seamless provision of reliable service by
 Long Island Water to all of its customers at just and reasonable rates.

2. The name, mailing and e-mail addresses, and telephone and facsimile numbers of the Joint Petitioners' attorneys are as follows:

Frank J. Miller Brian T. FitzGerald LeBoeuf, Lamb, Greene & MacRae, LLP 125 West 55<sup>th</sup> Street New York, NY 10019-5389 Phone: (212) 424-8000 Fax: (212) 424-8500 Email: <u>fmiller@llgm.com</u> Email: bfitzger@llgm.com Michael A. Sgro Vice President, Secretary and General Counsel Long Island Water Corporation American Water Northeast Region 131 Woodcrest Road Cherry Hill, New Jersey 08003 Tel: (856) 310-2210 Fax: (856) 310-2279 Email: msgro@amwater.com

### B. <u>OVERVIEW</u>

3. For nearly 60 years, American Water was one of the largest publiclytraded water companies in the United States, with its shares listed on the New York Stock Exchange. The Proposed Transaction is expected to result in American Water becoming the largest publicly-traded water company in the U.S. Being publicly-traded, like so many utility holding companies, served American Water, its subsidiaries, and their customers and employees well for many years and will again serve them well going forward.

4. As a publicly-traded company, American Water will be managed under the supervision of American Water's board of directors. Long Island Water will continue to be operated by its local management, under the supervision of Long Island Water's board of directors.

5. American Water will have a sound financial structure and, as a publiclytraded company, will be subject to the extensive disclosure and governance requirements of the Securities and Exchange Commission ("SEC") (including Sarbanes-Oxley-related requirements) and the stock exchange on which its shares are traded (intended to be the New York Stock Exchange).

6. The Proposed Transaction will also provide American Water with access to the public equity and debt capital markets in the U.S., maintaining American Water's ability to finance necessary and vital investments in the infrastructure of its subsidiaries, including Long Island Water.

7. The Proposed Transaction will produce benefits for Long Island Water's customers. It will result in a publicly-traded company that is focused on water and wastewater in the U.S. and dedicated to maintaining a high level of service at just and reasonable rates. Following the Initial Public Offering ("IPO"), customers will be able to invest in their water utility by buying American Water stock.

8. The Proposed Transaction should also facilitate the attraction and retention of highly-qualified and capable employees. Employees will be able to invest in their water utility by buying American Water stock. In addition, American Water may create an employee stock ownership plan following the Proposed Transaction.

9. The Proposed Transaction is beneficial to American Water and Long Island Water and their customers and employees and clearly is in the public interest.

### C. DESCRIPTION OF THE JOINT PETITIONERS

10. For ease of reference, the current relationships among the Joint Petitioners are shown on the organization chart, attached hereto as Exhibit A, Page 1. Exhibit A, Page 2 presents the contemplated organization chart following the consummation of the Proposed Transaction.

11. RWE Aktiengesellschaft ("RWE") is a foreign corporation organized and existing under the laws of the Federal Republic of Germany. RWE's principal office is located at Opernplatz 1, 45128 Essen, Federal Republic of Germany.

12. Thames GmbH is a foreign corporation organized and existing under the laws of the Federal Republic of Germany. Thames GmbH's principal office is located at Opernplatz 1, 45128 Essen, Federal Republic of Germany. It is a wholly-owned subsidiary of RWE. Thames GmbH is the holding company for most of RWE's water operations, both in the United States and in several foreign countries. Attached as Exhibit B is a copy of the certified excerpt from the Commercial Register of the Local Court of the City of Essen on the registration of Thames GmbH with that Commercial Register.

13. TWAUSHI is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ 08043. TWAUSHI is a wholly-owned subsidiary of Thames GmbH. In turn, TWAUSHI is the direct parent company of American Water. TWAUSHI does not conduct business in New York State, nor is it authorized to do so. TWAUSHI's subsidiaries now have approximately 7,000 employees and provide water, wastewater services and other water resource management services to approximately 18 million customers in 29 states and Canada. A certified copy of TWAUSHI's Certificate of Incorporation is attached as Exhibit C.

14. American Water is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ 08043. American Water owns regulated operating subsidiaries in 18 states. American Water does not conduct business in New York State, nor is it authorized to do so. A certified copy of American Water's Restated Certificate of Incorporation is attached as Exhibit D.

15. Long Island Water is a wholly-owned subsidiary of American Water. It is a regulated waterworks corporation organized and existing under the laws of the State of New York, with its principal office located at 733 Sunrise Highway, Lynbrook, New York. Long Island Water serves approximately 74,500 customers in southwestern Nassau County, New York. Long Island Water currently owns, operates and maintains potable water production, treatment, storage, transmission and distribution systems for the purpose of furnishing potable water for residential, commercial, industrial and governmental users in its service territory. A certified copy of Long Island Water Corporation's Amended and Restated Certificate of Incorporation was filed as Exhibit B to the Joint Petition of Long Island Water Corporation, American Water Works Company, Inc., Thames Water Aqua Holdings GmbH, and Apollo Acquisition Company for Approval of an Agreement and Plan of Merger Pursuant to Section 89h of the New York Public Service Law on December 20, 2001 in Case 01-W-1949.

### D. DESCRIPTION OF THE PROPOSED TRANSACTION

16. The Proposed Transaction consists of (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water and (ii) prior to the closing of the IPO, the merger of TWAUSHI with and into American Water. The shares will be sold through one or more underwritten public offerings to a broad group of investors, including institutional and retail investors. It is the desire of Thames GmbH to sell 100% of the shares in the IPO.

 Depending on market conditions, Thames GmbH may decide not to sell 100% of the shares in the IPO. The remainder of the shares would then be sold in a subsequent offering or offerings as soon as reasonably practicable following the IPO. The IPO and any subsequent public offerings will be conducted according to the rules for underwritten public offerings mandated by the SEC. The process for the IPO and any subsequent public offering is substantially the same, although the timeframe for subsequent public offerings is generally shorter. The following paragraphs describe this process in general terms.

17. The key participants in an underwritten public offering such as this one are the company in which the shares are being sold (in this case, American Water), which is referred to as the issuer; the underwriters, which will be a group of investment banks; and the seller of the shares (in this case, Thames GmbH). The primary role of the issuer is to prepare the necessary SEC filings, which include the prospectus that will be used to offer the shares to investors, and to have its senior management participate in marketing the offering to investors by, among other things, explaining American Water's business model, including its commitment to quality, health, safety, and efficient water resource management. The underwriters' role includes assistance in drafting the prospectus, leading the marketing effort, and participating in setting the price for the sale.

18. The first step in a public offering is the preparation and filing with the SEC of a registration statement. The registration statement for this type of offering is a document containing extensive information about the issuer and the offering. This primarily historical information includes, among other things, the issuer's audited financial statements, descriptions of its business and management, and other information about the issuer and the offering that investors may consider in deciding to buy the shares. The primary portion of an

 SEC registration statement is the prospectus, which is the document used to market the offering. The prospectus will include a clear statement that no investor is permitted to acquire control of American Water without obtaining any necessary regulatory approvals pursuant to applicable state laws.

19. Once an initial registration statement has been prepared, it will be filed with the SEC, at which point it will become publicly available on the SEC's web site. It is anticipated that this initial filing with the SEC will not occur before late 2006, when the state regulatory approval process is well underway. The SEC will review the initial registration statement and provide initial comments on the filing within four to six weeks of the filing, at which point American Water will file an amended registration statement addressing the SEC's comments. The amended registration statement will also become immediately available on the SEC's web site. The SEC may have further comments, in which case additional amendments must be filed until all comments are resolved. This review and comment process typically takes between two and three months from the time the initial registration statement is first filed with the SEC.

20. After the principal SEC comments have been resolved and the state regulatory approval process (including obtaining the approval of the Commission) has been completed, the marketing process will begin. During the marketing process, American Water's senior management, as well as some presidents of its utility subsidiaries, will travel throughout the United States to meet with potential investors on what is known as a "Road Show."

21. At the end of the marketing process, American Water will ask the SEC to declare the registration statement effective, and the underwriters and Thames GmbH will agree on a price per share at which the shares will be sold to the public. This stage is known as the
"Pricing." The agreement between Thames GmbH and the underwriters will be reflected in an underwriting agreement that is signed immediately after pricing.

22. As a technical matter, in an underwritten offering, the underwriters agree to buy the shares from the seller (pursuant to the underwriting agreement) and then in turn agree to re-sell them to the investors. Both the purchases by the underwriters and the subsequent sales are usually completed on the same day, at the closing of the offering. Although it is possible that investors could back out of their indication of interests, leaving the underwriters with an unsold allotment, this type of situation is uncommon. In such event, each underwriter must purchase its proportionate share of the unsold allotment, and each underwriter typically seeks to sell those shares as soon as reasonably practicable thereafter.

23. The closing of the offering, at which the purchases are settled, is required to take place three or four business days after pricing. The stock begins trading in the public market after pricing. In this case, the shares are intended to be listed on the New York Stock Exchange.

# E. CAPITAL STRUCTURE AND GOVERNANCE

24. The Proposed Transaction will not impair the ability of Long Island Water to maintain a reasonable capital structure that is representative of other utilities.

25. The debt of Long Island Water consists of (i) third-party debt issued by Long Island Water in the capital markets and (ii) inter-company debt owed by Long Island Water to American Water Capital Corp. ("AWCC"), which is a direct subsidiary of American Water. As of December 31, 2005, Long Island Water's debt consisted of \$38,930,000 in third-party debt and \$7,762,762 in inter-company debt to AWCC.

26. American Water has used AWCC as a financing vehicle since before RWE's acquisition of American Water. The purpose of AWCC is to borrow funds for the benefit of American Water and its regulated operating subsidiaries and then loan such borrowed funds to such companies. The advantage of this financing structure is that it allows Long Island Water to benefit from the economies of scale associated with group-wide debt financing and decreased administrative costs.

27. AWCC's debt consists of corporate loans from its ultimate parent, RWE, and a small amount of debt issued in the capital markets. As of December 31, 2005, AWCC's debt consisted of \$2,438,586,000 in inter-company debt to RWE and \$226,860,000 in third-party debt. AWCC is currently rated 'A-' (on negative credit watch) by Standard & Poor's and 'Baa1' (on negative outlook) by Moody's Investors Service, Inc. These ratings reflect the support AWCC receives from American Water.

28. In addition, as of December 31, 2005, American Water had inter-company debt to RWE of \$150,000,000. RWE also indirectly holds \$1.75 billion of preferred shares of American Water.

29. In connection with the Proposed Transaction, all inter-company financial relationships RWE has with American Water and its subsidiaries will be terminated. The precise timing and composition of any replacement financing will depend upon market conditions prevailing at the time of the financing. Following the Proposed Transaction, the capital structure of American Water is intended to be comparable to that of other publicly-traded utilities. American Water's objectives in designing this capital structure will be to provide ready and cost-efficient access to necessary capital and to maintain a solid investment grade rating for AWCC.

30. In certain instances, the refinancing of AWCC's debt with RWE may require changes in terms of the inter-company debt and Long Island Water will, if so required, seek approval from the Commission in a separate petition for any such changes that are determined to be necessary in connection with the refinancing.

31. Following the IPO, the board of directors of American Water will meet the requirements for boards of public companies. The board will consist of experienced individuals who, in the aggregate, possess the capabilities and experience appropriate for the board of a large, publicly-owned multi-state water utility. Federal securities laws and stock exchange rules also require, following completion of the Proposed Transaction, that the board have a majority of independent directors and that the audit, compensation and nominating committees consist entirely of independent directors.

32. As a publicly-traded company, American Water will become subject to the federal securities laws and regulations as well as the requirements of the stock exchange where American Water's common shares will be listed. Specifically, such laws and regulations will impose obligations on American Water and its subsidiaries related to financial reporting, accounting, internal controls, general business disclosure, corporate governance, executive compensation reporting, issuance of securities and related financial and business matters. American Water will be required to file annual, quarterly and current reports (relating to certain business events) with the SEC, and certain American Water investors will be required to make filings disclosing their American Water shareholdings (including, under certain circumstances, the purpose of acquiring such shareholdings). All financial information of American Water and its subsidiaries will have to be reported in accordance with U.S. generally accepted accounting principles ("GAAP") and SEC regulations. The annual consolidated financial statements of

American Water will be required to be audited. In addition, all filings with the SEC will be made immediately available on the SEC's web site, not only to investors, but to the public at large. American Water will also be required to comply with the extensive requirements imposed as a result of the recent federal Sarbanes-Oxley legislation. These requirements relate to, among other things, internal controls over financial reporting and external audit of such controls, corporate officer certification of financial and other information, corporate governance requirements, and enhanced and expedited disclosure (particularly with respect to certain financial information).

# F. THE PROPOSED TRANSACTION IS IN THE PUBLIC INTEREST

33. This Petition is being filed pursuant to Section 89-h of the New York State Public Service Law that provides which "[n]o [water works] corporation shall directly or indirectly acquire the stock or bonds of any other corporation incorporated for, or engaged in, the same or similar business, or proposing to operate or operating under a franchise from the same or other municipality, unless authorized to do so by the commission [and] no stock corporation of any description, domestic or foreign, other than a water-works corporation, shall purchase or acquire, take or hold, more than ten per centum of the voting capital stock issued by any waterworks corporation organized or existing under or by virtue of the laws of this state..." without the consent of the Commission.

34. In considering a request for approval pursuant to Section 89-h, the Commission is required to assess whether the transaction is in the public interest. Section 89-h provides, in pertinent part, that, "[n]o consent shall be given by the Commission to the acquisition of any stock in accordance with this section unless it shall have been shown that such acquisition is in the public interest." The Proposed Transaction clearly meets this test. As

detailed in the remainder of this section, the Proposed Transaction will result in a company with a sound financial structure that is focused on the water and wastewater business in the U.S., that will be well managed and that will provide benefits to both customers and employees of Long Island Water.

35. For nearly 60 years, American Water was one of the largest publiclytraded water companies in the United States, with its shares listed on the New York Stock Exchange. The Proposed Transaction is expected to result in American Water becoming the largest publicly-traded water company in the U.S. Being publicly-traded, like so many utility holding companies, served American Water, its subsidiaries, and their customers and employees well for many years and will again serve them well going forward.

36. The Proposed Transaction will result in a publicly-traded company that is focused on the water and wastewater business in the U.S. As a publicly-traded company, American Water will be better positioned to focus on maintaining, developing and growing the water and wastewater business of its subsidiaries, including Long Island Water, and on the needs of customers and employees.

37. Following the Proposed Transaction, American Water will be subject to the extensive disclosure requirements of the SEC (including Sarbanes-Oxley-related requirements) and the stock exchange on which its shares are traded. <u>See Section D. American</u> Water shareholders owning a significant number of shares will also be required under SEC regulation to report their American Water shareholdings publicly. Such disclosure will result in greater corporate transparency, including with respect to the operations and ownership of American Water and its subsidiaries.

38. The Proposed Transaction will provide American Water with access to the public equity and debt capital markets in the U.S., maintaining American Water's ability to finance necessary and vital investments in the infrastructure of its subsidiaries, including Long Island Water.

39. Long Island Water will continue to be a subsidiary of American Water and will be operated by its management, under the supervision of its board of directors. The experienced management at Long Island Water will continue to provide its financial, technical and managerial abilities to Long Island Water for the benefit of its customers and the communities they live in. American Water Works Service Company, Inc. will continue to provide customer service, accounting, administration, engineering, financial, human resources, information systems, operations, risk management, water quality and other services to Long Island Water.

40. American Water will continue to be operated by its management, under the supervision of its board of directors. The seasoned management team at American Water has (and will continue to have) the background necessary to run a large, publicly-traded water company.

41. The Proposed Transaction will result in a publicly-traded company that is focused on providing water and wastewater services to the public in the U.S. and dedicated to maintaining a high level of service at just and reasonable rates for the benefit of its customers and the communities it serves. Customers of Long Island Water will continue to receive the same high quality of service from highly-qualified employees, just as in the past.

42. Following the Proposed Transaction, customers will also be able to invest in their water utility by buying American Water stock.

43. The Proposed Transaction should facilitate the attraction and retention of highly-qualified and capable employees who will be drawn to working for a prestigious, high-profile, publicly-traded company. Employees will be able to invest in their water utility by buying American Water stock. In addition, American Water may create an employee stock ownership plan following the Proposed Transaction.

44. Long Island Water will continue to honor its collective bargaining agreements. The Proposed Transaction will not adversely impact employees or employment levels in New York State.

45. The Proposed Transaction will not adversely impact Long Island Water's rates or its policies with respect to service to customers, employees, operations, financing, or other matters affecting the public interest or utility operations. The transition to a publicly-traded company will similarly not adversely impact current investment and capital programs.

46. There are no material contemplated changes in the income statement, balance sheet or financial position of Long Island Water as a result of the Proposed Transaction. Applicants do not expect any adjustment to the existing book value of any of Long Island Water's assets as a result of the Proposed Transaction. Applicants do not seek recovery of the costs of the Proposed Transaction, which are comprised of the SEC registration fee, the NASD filing fee, the stock exchange listing fee, legal fees and expenses of the Proposed Transaction, accounting fees and expenses of the Proposed Transaction, printing and engraving fees and

expenses for the registration statement, Blue Sky fees and expenses, transfer agent fees and expenses, and legal fees for the state regulatory approval process.

47. Long Island Water will continue to provide safe, adequate and reliable service in fulfillment of its obligations under New York State and federal law.

48. Long Island Water, together with American Water, will continue to make extensive contributions to the state and local economies and continue Long Island Water's commitment to the local communities it has known and served for years.

49. The Proposed Transaction does not affect the Commission's powers with respect to Long Island Water or the authority of other governmental agencies as to Long Island Water's services or facilities. Long Island Water will remain subject to all applicable laws, regulations, rules, decisions and policies governing the regulation of New York State public utilities.

50. RWE has no intention of permitting any person to acquire a controlling interest in American Water through the Proposed Transaction. Consequently, the Joint Petitioners do not request approval for any individual or group to acquire a controlling interest in American Water in either the IPO or subsequent public offerings. New York State statutes prohibit any person from acquiring a controlling interest in a utility holding company such as American Water without first obtaining approval from the Commission. Section 89-h specifies that any such acquisition consummated without the requisite prior approval is void. The prospectus pursuant to which the shares will be sold in the IPO will include disclosure about the relevant statutory restrictions and the consequences of a violation.

51. For the reasons stated in the preceding paragraphs of this Section, the Proposed Transaction is clearly in the public interest.

## G. SUPPORTING DATA

52. Because the Proposed Transaction is an IPO for the sale of stock and not an acquisition, 16 NYCRR Part 39 is not applicable to the Proposed Transaction. However, the Joint Petitioners have used Part 39 as a guide to the type of information included herein. Section 39.1(a) of the regulations requires that the applicant's financial condition be submitted (if it is a public utility) and for the corporation whose stock is sought to be acquired. Because the IPO will not occur until after approval of the Proposed Transaction, the Joint Petitioners are unable to provide financial information about potential acquiring parties. Moreover, American Water is a foreign non-utility holding company whose stock, in turn, is wholly-owned by TWAUSHI, also a foreign non-utility holding company. Accordingly, the detailed information that is required of a public utility relating to financial conditions as set forth in 16 NYCRR Section 18.1 is inapplicable to the Proposed Transaction.

53. With respect to the merger of TWAUSHI with and into American Water, as a result of the merger each outstanding share of TWAUSHI will be cancelled and cease to exist. Following the consummation of the merger, Thames GmbH will be the sole shareholder of American Water.

54. A statement listing the filings made or to be made with Federal and state authorities before the Proposed Transaction can be consummated is attached as Exhibit E. No authorizations have been received to date.

55. Coincident with the filing of this Petition, Joint Petitioners shall file with the Commission a short-form Environmental Assessment Form. For convenience, a copy of the filing is attached as Exhibit F.

#### H. CORPORATE APPROVALS

56. The Proposed Transaction will have been, before its execution, approved by the Supervisory Board of RWE and by the boards of directors of the Joint Petitioners. Approval by the Shareholders of RWE is not required.

# I. NOTICE

57. Notice of the Proposed Transaction will be provided to customers of Long Island Water by way of a bill insert no later than the next full billing cycle after filing of this Petition. In addition, the Joint Petitioners have prepared, and attached as Exhibit G, a draft State Administrative Procedure Act notice suitable for publication in the New York State Register. WHEREFORE, for the foregoing reasons, the Joint Petitioners respectfully

request that the Commission approve this Petition and authorize the Proposed Transaction and the resulting transfer of control of Long Island Water.

Respectfully submitted,

Brian J. Felz Herald / clc

April 21, 2006

Frank J. Miller Brian T. FitzGerald

Of Counsel

LeBoeuf, Lamb, Greene & MacRae LLP 125 West 55<sup>th</sup> Street New York, New York 10019-5389 Tel: (212) 424-8000 Fax: (212) 424-8500 Email: <u>fmiller@llgm.com</u> Email: <u>bfitzger@llgm.com</u>

AL94733.4

Michael A. Sgro Vice President, Secretary and General Counsel Long Island Water Corporation American Water Northeast Region 131 Woodcrest Road Cherry Hill, New Jersey 08003 Tel: (856) 310-2210 Fax: (856) 310-2279 Email: <u>msgro@amwater.com</u>

# BEFORE THE STATE OF NEW YORK PUBLIC SERVICE COMMISSION

	X	
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Joint Petition of Thames Water Aqua Holdings	:	
GmbH, Thames Water Aqua US Holdings, Inc.,	:	
American Water Works Company, Inc. and Long	:	
Island Water Corporation For Approval of the	:	Case 06-W
Merger of Thames Water Aqua US Holdings, Inc.	:	
With and Into America Water Works Company,	:	
Inc. and the Subsequent Sale Of The Shares	:	
Of The Common Stock Of American Water	:	
Works Company, Inc.	•	

#### VERIFICATION

STATE OF NEW JERSEY

COUNTY OF CAMDEN

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Michael A. Sgro, being duly sworn, deposes and states as follows:

- 1. I am Vice President, Secretary and General Counsel of Long Island Water Corporation.
- 2. I am authorized to sign this verification on behalf of Long Island Water Corporation.
- 3. I have reviewed the foregoing Joint Petition and the statements of fact contained therein are true and correct to the best of my knowledge, information and belief.

Michael A. Sgro

Sworn to and subscribed before me this  $\mathcal{X}$  day of April, 2006.

Notary Public

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SUSAN J. MALLETT , NOTARY PUBLIC OF NEW JERSEY MY COMMISSION EXPIRES JANUARY 14, 2009

# **BEFORE THE** STATE OF NEW YORK PUBLIC SERVICE COMMISSION

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:

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc. -----X \_\_\_\_\_

Case 06-W-

### VERIFICATION

STATE OF NEW JERSEY

COUNTY OF CAMDEN

John R. Bigelow, being duly sworn, deposes and states as follows:

)ss:.

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- 1. I am Senior Vice President, Regulatory Programs & Enterprise Risk Management for American Water Works Company, Inc. ("American Water") and Thames Water Aqua US Holdings, Inc. ("TWAUSHI").
- 2. I am authorized to sign this verification on behalf of American Water and TWAUSHI.
- 3. I have reviewed the foregoing Joint Petition and the statements of fact contained therein are true and correct to the best of my knowledge, information and belief.

John R. Bigelow

Sworn to and subscribed before me this 20th day of April, 2006.

# **BEFORE THE** STATE OF NEW YORK PUBLIC SERVICE COMMISSION

:

-----X

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc. -----X

Case 06-W-

### **VERIFICATION**

STATE OF NEW JERSEY

COUNTY OF CAMDEN

Jens Gemmecke, being duly sworn, deposes and states as follows:

)ss:.

- 1. I am counsel for Thames Water Aqua Holdings GmbH ("Thames GmbH").
- 2. I am authorized to sign this verification on behalf of Thames GmbH.
- 3. I have reviewed the foregoing Joint Petition and the statements of fact contained therein are true and correct to the best of my knowledge, information and belief.

Jens Gemmecke

Sworn to and subscribed before me this 20th day of April, 2006.

otary Public

# EXHIBIT LIST

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Exhibit	Document
А	Current and Contemplated Organization Charts
В	Copy of certified excerpt from the Commercial Register of the Local Court of the City of Essen on the registration of Thames GmbH
С	Certified true and correct copy of the Certificate of Incorporation of Thames Water Aqua US Holding, Inc.
D	Certified true and correct copy of Restated Certificate of Incorporation of American Water Works Company, Inc.
Е	Statement of Federal and State Authorities from which Approval Must be Obtained Before the Proposed Transaction may be Consummated
F	Copy of draft Short Environmental Assessment Form, with Attachment
G	Draft State Administrative Procedure Act Notice

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a ₽ - Exhibit A - Page 1 -

Current Relationships among the Joint Petitioners



Exhibit A - Page 2 -

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# Contemplated Organization Chart following consummation of the Proposed Transaction

publicly traded shares of common stock intended to be listed on the New York Stock Exchange

American Water Works Company, Inc. ("American Water") Long Island Water Corporation ("Long Island Water")

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# - Translation from the German, page 1 -

Comm	ercial Register B of the District Cou	urt of Essen	Official p	rintout	Company number:	IRB 14447			
	Request of 29 December 2005, 2:46 p.m. Page 1 of 4 pages								
No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	<ul> <li>a) General rule for</li> <li>representation</li> <li>b) Board members, personally</li> <li>liable shareholders, managing</li> <li>directors, powers of attorney</li> <li>and special power of</li> <li>representation</li> </ul>	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes			
1	22	3	4	5	6	7			
1	<ul> <li>a) <u>GBV Gesellschaft für</u> <u>Beteiligungsverwaltung mbH</u></li> <li>b) Essen</li> <li>c) The acquisition and the administration of shares in companies in Germany and abroad.</li> </ul>	<u>EUR 50.000.00</u>	<ul> <li>a) If only one managing director has been appointed, he shall represent the company alone. If more than one managing director has been appointed, the company will be represented by two managing directors or by one managing directors or by one managing director acting jointly with an authorised signatory. By resolution of the Shareholders' Meeting, managing directors can also be granted power to represent the company alone. Managing directors can also be granted by a resolution of the Shareholders' Meeting the right to carry out on behalf of the company legal acts with himself in his own name or as representative of a third party.</li> <li>b) Managing director: Dr. Klaus Sturany, Dortmund, DOB 23.10.1946 Managing director: Dr. Richard Klein, DOB 23</li> </ul>		a) Gesellschaft mit beschränkter Haftung (limited liability company under German Iaw) Articles of Association of 12 September 2000	a) 6 October 2000 xxx b) Articles of Association, sheet 10 – 14 Special volume Day of first entry: 21 September 2000 This page was transcribed for continuation by electronic data processing and replaced the former register sheet Approved 6 October 2000			
2				Joint statutory signing authority together with one managing director or another officer with statutory signing authority. <u>Werner Böttcher, economist,</u> <u>Duisburg, DOB 24.06.1955</u> Dr. rer. pof. Daniel Koths, Duisburg, <u>DOB 15.11.1946</u> <u>Dr. jur. Georg Müller, Monheim,</u> DOB 23.02.1963		a) 25 October 2000 Werner			

Commercial Register B of the District Court of Essen Official printout Request of 29 Decem ->This printout is not signed and has the status of a certified copy<				r <mark>intout</mark> of 29 December 2005, 2:46 p.n rtified copy<-	Company number: H n. Page 2 of 4 pa	IRB 14447 ages
No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes
1	2	3	4	5	6	7

		h h h	a)
3	EUR 500 million		d) 47 November 2000
		By a resolution of the Shareholders' Meeting of	17 November 2000
		14 November 2000, the capital stock was	Bacht
		increased by EUR 499,950,000 from EUR	
		50,000 to EUR 500 million and section 4 of	
		the Articles amended accordingly.	
4	EUR 501 million	b) The Shareholders' Meeting resolved on 25	a)
		June 2001 to increase the capital stock by	6 July 2001
		EUR 1,000,000,000 from EUR 500 million to	Bacht
		EUR 501 million with a view to performing a	~
		spin-off for incorporating the "Wasser" division	
		from the assets of RWE Umwelt	
		Aktiengesellschaft, Essen, and to amend	
		section 4 of the Articles accordingly.	
5		b) On the basis of the spin-off agreement of 25	a)
		June 2001 and the approval resolution of the	6 July 2001
		Shareholders' Meeting of RWE Umwelt	Bacht
		Aktiengesellschaft, Essen, and the approval	~~
		resolution of the Shareholders' Meeting of the	
		company of the same date, RWE Umwelt	
		Aktiengesellschaft, Essen, by way of a spin-off	
		for incorporating as part of its assets in	
		accordance with section 123, sub-section 2.	
		number 1 UmwG, transferred to the company	
		the "Wasser" division with all rights and	
		obligations in its entirety in accordance with	
		the said spin-off and transfer agreement.	
		The spin-off comes into force only when	
		entered in the register at the place of domicile	
		of the transferring entity	
1		A control and profit-distribution agreement	
		concluded on 28 February 2001 with BWF	
		Aktiengesellschaft Essen as controlling	
		entermise is in force which was approved by	
		the Shareholders' Meeting of the commany by	
		its ruling of 28 Eabriany 2001 and the	
		Sharaholders' Meeting of DW/E Limural	
1			
L		Akuengeselischart of 7 June 2001.	

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Comm	ercial Register B of the District Cor	urt of Essen	Official p	rintout	Company number: H	IRB 14447
	-		Request of	of 29 December 2005, 2:46 p.i	n. Page 3 of 4 pa	ages
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No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes
1	2	3	4	5	6	/
6					b) The Shareholders' Meeting resolved on 25 June 2001 to increase the capital stock by EUR 1 million from EUR 500 million to EUR	a) 16 July 2001 Schulz
					501 million with a view to performing a spin- off for incorporating the "Wasser" division from the assets of RWE Umwelt Aktiengesellschaft, Essen, and to amend section 4 of the Articles accordingly.	b) The amount of capital increase shoutd read EUR 1 million. (number 4, column 6a) marked in red accordingly. Entered as official act.
7					b) The spin-off came into force with entry in the register sheet of the transferring entity on 19 July 2001.	a) 20 July 2001 Wemer
8	a) Thames Water Aqua Holdings GmbH				a) The Shareholders' Meeting of 9 August 2001 resolved to change the name of the company and to amend section 1, sub- section 1 of the Articles accordingly.	a) 14 August 2001 Bacht
9			b) Appointed managing director: Bill Alexander, Henley-on- Thames (GB), DOB: 15 February 1947			a) 14 November 2001 Blöcker
10				Statutory signing authority cancelled: Werner Böttcher, economist, Duisburg, DOB 24.06.1955		3 May 2002 Blöcker
11			b) No longer managing director: Dr. Richard Klein, DOB 23 November 1943 Appointed managing director: Jan Zilius, Essen, DOB: 20 March 1946			a) 31 March 2003 Wyczisk

Commercial Register B of the District Court of Essen		urt of Essen	<b>Official printout</b> Request of 29 December 2005, 2:46 p.r		Company number: HRB 14447 n. Page 3 of 4 pages				
	->This printout is not signed and has the status of a certified copy<-								
No. of entry	a) Company name b) Legal domicile, branches c) Object of the company	Original or Share capital	a) General rule for representation b) Board members, personally liable shareholders, managing directors, powers of attorney and special power of representation	Procuration (statutory signing authority)	a) Legal status, commencement, statutes or articles of association b) Other legal particulars	a) Date of entry b) Notes			
<u>1</u>	2	3	4	5	6	7			
12				Statutory signing authority cancelled: Dr. jur. Georg Müller, Monheim- Baumberg, DOB 23.02.1963 Joint statutory signing authority together with one managing director or another officer with statutory signing authority: Dr. Jens Hüffer, Düsseldorf, DOB: 20 July 1965	a) The Shareholders' Meeting resolved on 30 June 2003 to amend section 9 (Annual financial statement and use of profit) of the Articles.	a) 5 August 2003 Moritz 10 October 2003 Werner			
14			b) <u>No longer managing director:</u> <u>Bill Alexander, Henley-on-</u> <u>Thames (GB), DOB: 15</u> <u>February 1947</u>			a) 15 December 2005 Wemer			
15					a) The Shareholders' Meeting resolved on 19 December 2005 to amend section 3, sub- section 3 (Announcements). of the Articles	a) 29 December 2005 Vrenegor			

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Essen, 29 December 2005 The printout certifies the contents of the Commercial Register. Vrenegor, Clerk of the Court, Certifying Officer of the Record Office

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[stamp of the District Court of Essen]

Hendelsregister B des Amtsgerichts Essen

Amtlicher Ausdruck Abruf vom 29.12.2005 14:50 Nummer der Firma: Seite 1 von 4

HRB 14447

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N E	ummer der intragu ng	a) Firma b) Sitz, Niederlassung, Zweigniederlassungen c) Gegenstand des Unternehmens	Grund- oder Stammkapi tal	a) Allgemeine Vertretungsregelung b) Vorstand, persönlich haftender Gesellschafter, Geschäftsführer. Vertretungsberechtigte und besondere Vertretungsbefugnis	Prokura	a) Rechtsform, Beginn, Satzung oder Gesellschaftsvertrag b) Sonstige Rechtsverhältnisse	a) Tag der Eintragung b) Bemerkungen
	1	2	3	4	5	6	7
	1	a) <u>GBV Gesellschaft für</u> <u>Beteiligungsverwaltung mbH</u> b) Essen c) Der Erwerb und die Verwaltung von Beteiligungen an Unternehmen im In- und Austand.	<u>50.000,00</u> <u>EUR</u>	a) Ist nur ein Geschäftsführer bestellt, so vertritt er die Gesellschaft allein. Sind mehrere Geschäftsführer bestellt, so wird die Gesellschaft durch zwei Geschäftsführer oder durch einen Geschäftsführer gemeinsam mit einem Prokuristen vertreten. Durch Beschluss der Gesellschafterversammlung kann Geschäftsführern Einzetvertretungsbefugnis erteilt werden. Auch können Geschäftsführern durch Gesellschafterbeschluss ermächtigt werden, die Gesellschaft bei der Vornahme von Rechtsgeschäften mit sich im eigenen Namen oder als Vertreter eines Dritten uneingeschränkt zu vertreten. b) Geschäftsführer: Dr. Sturany, Klaus, *23.10.1946 <u>Geschäftsführer:</u> Dr. Klein, Richard, *23.11.1943		a) Gesellschaft mit beschränkter Haftung Gesellschaftsvertrag vom 12. September 2000.	a) 06.10.2000 Nakti b) Gesellschaftsvertrag Blatt 10 - 14 Sonderband. Tag der ersten Eintragung: 21.09.2000 Dieses Blatt ist zur Fortführung auf EDV umgeschrieben worden und dabei an die Stelle des bisherigen Registerblattes getreten. Freigegeben am 06.10.2000.
	2				Gesamtprokura gemeinsam mit einem Geschäftsführer oder einem anderen Prokuristen. <u>DiplÖkonom Böttcher, Werner, Duisburg,</u> <u>*24.06.1955</u> Dr. rer. pol. Kolhs, Daniel, Duisburg, *15.11.1946 <u>Dr. jur. Müller, Georg, Monheim,</u> <u>*23.02.1963</u>		a) 25.10.2000 Werner
	3		500.000.000 ,00 EUR			b) Durch Beschluß der Gesellschafterversammlung vom 14. November 2000 wurde das Stammkapital von Euro 50.000, um Euro 499.950.000, auf Euro 500.000.000,00 erhöht und die Satzung entsprechend in § 4 geändert.	a) 17.11.2000 Bacht
	4		501.000.000			a)	a)

andelsregister B des Amtsgerichts Essen

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Nummer der Firma: Seite 2 von 4 HRB 14447

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	· •		Vertretungsbefugnis			
1	2	3	4	5	Б 	
		,00 EUR	•		Die Gesellschafterversammlung hat am 25. Juni 2001 beschlossen, das Stammkapilal zum Zwecke der Durchführung der Abspaltung zur Aufnahme des Unternehmensbereichs "Wasser" aus dem Vermögen der RWE Umwelt Aktiengesellschaft, Essen, von EUR 500.000.000,00 um EUR 1.000.000.000,- auf EUR 501.000.000,00 zu erhöhen und den Gesellschaftsvertrag entsprechend in § 4 zu ändern.	06.07.2001 Bacht
5					<ul> <li>b)</li> <li>Die RWE Umwelt Aktiengesellschaft, Essen, haf durch Abspaltungsvertrag vom 25. Juni 2001 und aufgrund des Zustimmungsbeschlusses der Hauptversammlung der RWE Umwelt Aktiengesellschaft, Essen, und des Zustimmungsbeschlusses der Gesellschafterversammlung der Gesellschaft vom gleichen Tag im Wege der Abspaltung zur Aufnahme gemäß § 123 Abs. 2 Nr. 1 UmwG als Teil ihres Vermögens den Unternehmensbereich Wasser mit allen Rechten und Pflichten als Gesamtheit nach näherer Maßgabe des oben genannten Abspaltungs- und Übernahmevertrages auf die Gesellschaft übertragen.</li> <li>Die Spaltung wird erst mit der Eintragung im Register des Sitzes des übertragenden Rechtsträgers wirksam.</li> <li>Es besteht ein am 28.02.2001 geschlossener Beherrschungs- und Gewinnabführungsvertrag mit der RWE Aktiengesellschaft, Essen, als herrschendem Unternehmen, dem die Gesellschafterversammlung der Gesellschaft durch Beschluss vom 28.02.2001 und die Hauptversammlung der RWE Umwelt Aktiengesellschaft am 07. Juni 2001 zugestimmt haben.</li> </ul>	a) 10.07.2001 Bacht
6					a) Die Gesellschafterversammlung hat am 25. Juni 2001 beschlossen, das Stammkapital zum Zwecke der Durchführung der Abspaltung zur Aufnahme des Unternehmensbereichs "Wasser" aus dem Vermögen der RWE Umwelt Aktiengesellschaft,	a) 16.07.2001 Schutz b) Der

andelsregister B des Amtsgerichts Essen

#### Amtlicher Ausdruck Abruf vom 29.12.2005 14:50

Nummer der Firma: Seite 3 von 4

HRB 14447

->Dieser Ausdruck wird nicht unterschrieben und gilt als beglaubigte Abschrift<-

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Nummer der Eintragu ng	a) Firma b) Sitz, Niederlassung, Zweigniederlassungen c) Gegenstand des Unternehmens	Grund- oder Stammkapi tal	a) Allgemeine Vertretungsregelung b) Vorstand, persönlich haftender Gesellschafter, Geschäftsführer, Vertretungsberechtigte und besondere Vertretungsbefugnis	Prokura ·	a) Rechtsform, Beginn, Satzung oder Gesellschaftsvertrag b) Sonstige Rechtsverhältnisse	a) Tag der Eintragung b) Bemerkungen
1	2	3	4	5	6	7
					Essen, von EUR 500.000.000,000 um EUR 1.000.000,- - auf EUR 501.000.000,00 zu erhöhen und den Gesellschaftsvertrag entsprechend in § 4 zu ändern.	Kapitalerhöhungsbetr ag beträgt richtig: 1.000.000, EUR, (lfd. Nr. 4 Sp. 6 a) entsprechend gerötet. Von Amts wegen eingetragen.
7					b) Die Abspaltung ist mit der Eintragung auf dem Registerblatt des übertragenden Rechtsträgers am 19.07.2001 wirksam geworden.	a) 20.07.2001 Werner
8	a) Thames Water Aqua Holdings GmbH				a) Die Gesellschafterversammlung vom 9. August 2001 hat beschlossen, die Firma des Unternehmens und entsprechend den Gesellschaftsvertrag in § 1 Abs. 1 zu ändem.	a) 14.08.2001 Bacht
9			b) <u>Bestelli zum</u> <u>Geschäftsführer:</u> <u>Alexander, Bill, Henley-on-Thames (GB),</u> <u>*15.02.1947</u>			a) 14.11.2001 Blöcker
10		•		Prokura erloschen: DiplÖkonom Böttcher, Werner, Duisburg, *24.06.1955		03.05.2002 Blöcker
11			b) <u>Nicht mehr</u> <u>Geschäftsführer:</u> <u>Dr. Klein, Richard, *23.11.1943</u> Bestellt zum Geschäftsführer: Zilius, Jan, Essen, *20.04.1946			a) 31.03.2003 Wyczisk
12					a) Die Gesellschafterversammlung hat am 30. Juli 2003 beschlossen, den Gesellschaftsver(rag in § 9 (Jahresabschluss und Ergebnisverwendung) zu ändern.	a) 05.08.2003 Moritz

Melsregister B des Amtsgerichts Essen

#### Amtlicher Ausdruck Abruf vom 29.12.2005 14:50

Nummer der Firma: Seite 4 von 4 HRB 14447

->Dieser Ausdruck wird nicht unterschrieben und gilt als beglaubigte Abschrift<-

Nummer der Eintragu ng	a) Firma b) Sitz, Niederlassung, Zweignlederlassungen c) Gegenstand des Unternehmens	Grund- oder Stammkapi tal	a) Allgemeine Vertretungsregelung b) Vorstand, persönlich haftender Gesellschafter, Geschäftsführer, Vertretungsberechtigte und besondere Vertretungsbefugnis	Prokura	a) Rechtsform, Beginn, Satzung oder Gesellschaftsvertrag b) Sonstige Rechtsverhältnisse	a) Tag der Eintragung b) Bemerkungen
	2	3	4	5	6	7
13				Prokura erloschen: Dr. jur, Müller, Georg, Monheim- Baumberg, *23.02.1963 Gesamlprokura gemeinsam mit einem Geschäftsführer oder einem anderen Prokuristen: Dr. Hüffer, Jens, Düsseldorf, *20.07.1965		10.10.2003 Werner
14			b) <u>Nich1 mehr</u> <u>Geschäftsführer.</u> <u>Alexander, Bill, Henley-on-Thames (GB),</u> <u>*15.02.1947</u>			a) 15.12.2005 Werner
15		-			a) Die Gesellschafterversammlung hat am 19. Dezember 2005 beschlossen, den Gesellschaftsvertrag in § 3 Abs. 3 (Bekannlmachungen) zu ändern.	a) 29.12.2005 Vrenegor

Essen, 29.12.2005 Der Ausdruck bezeugt den Inhalt des Handelsregisters Vrenegor, Justizangestellte Urkundsbeamter der Geschäftsstelle

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I, HARRIET SMITH WINDSOR, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF INCORPORATION OF "THAMES WATER AQUA US HOLDINGS, INC.", FILED IN THIS OFFICE ON THE TWENTY-SIXTH DAY OF JULY, A.D. 2002, AT 2:45 O'CLOCK P.M.



et Smith Windson

Harriet Smith Windsor, Secretary of State AUTHENTICATION: 4668033

DATE: 04-13-06

060349568

STATE OF DELAWARE SECRETARY OF STATE DIVISION OF CORPORATIONS .02 FILED 02:45 PM 07/26/2002 020478869 - 3552170

#### CERTIFICATE OF INCORPORATION

#### OF

#### THAMES WATER AQUA US HOLDINGS, INC.

#### ARTICLE I

#### Name

The name of the corporation (which is hereinafter referred to as the "Corporation") is:

Thames Water Aqua US Holdings, Inc.

#### ARTICLE II

#### Registered Office and Registered Agent

The address of the Corporation's registered office in the State of Delaware is c/o The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, City of Wilmington, County of New Castle, Delaware 19801. The name and address of the registered agent for service of process on the Corporation is The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, City of Wilmington, County of New Castle, Delaware 19801.

#### ARTICLE III

#### Business or Purposes to be Conducted or Promoted

The purpose for which the Corporation is organized is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

#### ARTICLE IV

#### Capital Stock

The total number of shares of stock that the Corporation shall have authority to issue is 1000 shares of Common Stock, par value of \$1.00 per share.

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#### ARTICLE V

#### Incorporator

The name and mailing address of the incorporator is Arthur McMahon, III, Cravath, Swaine & Moore, Worldwide Plaza, 825 8th Avenue, New York, New York, 10019.

#### ARTICLE VI

# Business and Affairs of the Corporation

For the management of the business and for the conduct of the affairs of the Corporation, and in further definition, limitation and regulation of the powers of the Corporation and of its directors and stockholders, it is further provided that:

(a) the number of directors of the Corporation shall be fixed by, or in the manner provided in, the By-laws of the Corporation;

(b) in furtherance and not in limitation of the powers conferred by the laws of the State of Delaware, the Board of Directors is expressly authorized and empowered to make, alter, amend or repeal any by-law of the Corporation;

(c) in addition to the powers and authorities herein or by statute expressly conferred upon it, the Board of Directors may exercise all such powers and do all such things and acts as may be exercised or done by the Corporation, subject, nevertheless, to the provisions of the laws of the State of Delaware, of this Certificate of Incorporation and of the By-laws of the Corporation; and

(d) unless and except to the extent that the Bylaws of the Corporation so require, the election of directors of the Corporation need not be by written ballot.

#### ARTICLE VII

#### Indemnification

(a) To the fullest extent that the General Corporation Law of the State of Delaware as it exists on the date hereof or as it may be hereafter amended permits the limitation or elimination of the liability of directors, no director of the Corporation shall be liable to the

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Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director. No amendment to or repeal of this Article shall apply to or have any effect on the liability or alleged liability of any director of the Corporation for or with respect to any acts or omissions of such director occurring prior to such amendment or repeal.

(b) In addition to any requirements of law and any other provision herein or in the terms of any class or series of capital stock having a preference over the common stock of the Corporation as to dividends or upon liquidation (and notwithstanding that a lesser percentage may be specified by law), the affirmative vote of the holders of 80% or more of the voting power of the then outstanding voting stock of the Corporation, voting together as a single class, shall be required to amend, alter or repeal any provision of this Article.

IN WITNESS WHEREOF, I, Arthur McMahon, III, the Sole Incorporator of Thames Water Aqua US Holdings, Inc. have executed this Certificate of Incorporation this 26th day of July, 2002, and DO HEREBY CERTIFY under the penalties of perjury that this instrument is my act and deed and that the facts stated herein are true.

Arthur McMahon, III Incorporator

Incorporator Mailing Address:

CSM ·

Cravath, Swaine & Moore Worldwide Plaza 825 8th Avenue New York, New York 10019

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The First State

I, HARRIET SMITH WINDSOR, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE RESTATED CERTIFICATE OF "AMERICAN WATER WORKS COMPANY, INC.", FILED IN THIS OFFICE ON THE TWENTIETH DAY OF JUNE, A.D. 2003, AT 2:41 O'CLOCK P.M.



Harriet Smith Windson

Harriet Smith Windsor, Secretary of State AUTHENTICATION: 4668022

DATE: 04-13-06

0352210 8100 060349559

State of Delaware Secretary of State Division of Corporations Delivered 02:43 PM 06/20/2003 FILED 02:41 PM 06/20/2003 SRV 030409293 - 0352210 FILE

#### RESTATED

#### CERTIFICATE OF INCORPORATION

#### OF

#### AMERICAN WATER WORKS COMPANY, INC.

American Water Works Company, Inc., a corporation organized under the laws of the State of Delaware (the "Corporation"), hereby certifies as follows:

A. The name of the Corporation is American Water Works Company, Inc. The Corporation was originally incorporated under the name American Communities Company, and the original Certificate of Incorporation of the Corporation was filed with the Secretary of State of the State of Delaware on August 28, 1936.

B. This Restated Certificate of Incorporation, which amends the provisions of the Corporation's Certificate of Incorporation as heretofore amended, restated and supplemented, was duly adopted by the Board of Directors of the Corporation and by the sole stockholder of the Corporation in accordance with the provisions of Sections 228, 242 and 245 of the General Corporation Law of the State of Delaware.

C. The text of the Certificate of Incorporation of the Corporation, as heretofore amended, restated and supplemented, is hereby amended and restated to read in its entirety as follows:

#### ARTICLEI

The name of the corporation (hereinafter called the "Corporation") is American Water Works Company, Inc.

#### ARTICLE II

The address of the Corporation's registered office in the State of Delaware is 1209 Orange Street, in the City of Wilmington, County of New Castle, Delaware 19801. The name of the Corporation's registered agent at such address is The Corporation Trust Company.

#### ARTICLE III

The purpose of the Corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware.

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## ARTICLE IV

A. <u>Authorized Capital Stock</u>. The total number of shares of all classes of stock that the Corporation shall have authority to issue is 2,750 shares, consisting of (i) 1,000 shares of common stock having the par value of \$1.00 per share (the "Common Stock") and (ii) 1,750 shares of preferred stock having no par value (the "Preferred Stock").

B. <u>Preferred Stock</u>. The powers, preferences and rights and the qualifications, limitations and restrictions of the Preferred Stock are as follows:

Dividends. The holders of the outstanding shares of Preferred Stock shall 1. be entitled to receive, when, as and if declared by the Board of Directors of the Corporation, out of the assets of the Corporation legally available therefor, cumulative preferential dividends at a rate equal to 5.9% per annum (the "Dividend Rate") of the Liquidation Preference (as defined below) of such shares, payable in cash quarterly in arrears commencing on September 15, 2003. Dividends shall begin to accrue and be cumulative on outstanding shares of Preferred Stock from the date of issuance of such shares. If the full amount of accrued dividends, whether or not declared, is not paid on a Dividend Payment Date (as defined below), then interest shall accrue on any unpaid amounts at a rate equal to the Dividend Rate until such amounts are paid in full. No dividend may be paid on the Common Stock unless all outstanding dividends then owed on the Preferred Stock have been naid in full. As used herein, "Dividend Payment Date" shall mean Murch 15, June 15, September 15 and December 15 of each year; provided, however, that if any such day is not a day on which commercial banks are open for general business in the City of New York (a "Business Day"), then the Dividend Payment Date shall be the Business Day immediately preceding such day. The holders of shares of Preferred Stock shall not be entitled to any dividends or other distributions in respect of the Preferred Stock except as provided berein.

2. Voting Rights.

(a) Except as otherwise expressly required under Delaware law or provided in this Restated Certificate of Incorporation, the holders of the outstanding shares of Preferred Stock shall not be entitled to vote on any matter required or permitted to be voted on by the stockholders of the Corporation.

(b) Notwithstanding paragraph (a) of this Section 2, so long as any shares of Preferred Stock are issued and outstanding, the Corporation shall not, without the affirmative vote or consent of the holders of two-thirds of the shares of Preferred Stock at the time outstanding voting as a separate class, alter or change any of the powers, preferences or special rights of the shares of Preferred Stock so as to affect them adversely.

(c) Notwithstanding paragraph (a) of this Section 2, if dividends on the shares of Preferred Stock outstanding are unpaid and in arrears for six consecutive months or more, thereafter and until all accrued and unpaid dividends, whether or not declared, on the shares of Preferred Stock outstanding shall have been paid in full, each share of Preferred Stock shall entitle the holder thereof to one (1) vote on all matters submitted to a vote of the stockholders of the Corporation.

#### 3. Liquidation Preference.

In the event of any liquidation, dissolution or winding up of the Corporation, whether voluntary or involuntary (a "Liquidation Event"), the holders of the outstanding shares of Preferred Stock shall be entitled to receive out of the assets of the Corporation available for distribution to its stockholders, prior and in preference to any distribution of any of the assets of the Corporation to the holders of Common Stock, the amount in cash equal to the sum of \$1,000,000 per share (the "Liquidation Preference") <u>plus</u> an amount in cash equal to all accrued and unpaid dividends thereon, whether or not declared, to the date fixed for liquidation, dissolution or winding up (such sum, the "Aggregate Liquidation Amount"). If, upon the occurrence of a Liquidation Event, the assets of the Corporation shall be insufficient to permit the payment to the holders of the Preferred Stock the full Aggregate Liquidation Amount, then the entire assets of the Corporation, or the proceeds thereof, legally available for distribution shall be distributed ratably among the holders of the Preferred Stock on the basis of the number of shares of Preferred Stock held by each. After payment in full in cash of the Aggregate Liquidation Amount, the holders of shares of Preferred Stock will not be entitled to any further participation in any distribution of assets of the Corporation.

As used herein, a Liquidation Event shall include any consolidation, merger, or reorganization pursuant to which Permitted Persons do not continue to hold at least a majority of the voting power of the Common Stock after such event. In addition, a sale, transfer or other disposition of all or substantially all of the Corporation's assets shall be deemed to be a Liquidation Event for purposes of this Restated Certificate of Incorporation. As used herein, "Permitted Persons" shall mean RWE Aktiengesellschaft and any corporation, limited liability company, association or other entity of which securities or other equity interests representing more than 50% of the equity and more than 50% of the ordinary voting power are directly or indirectly held by RWE Aktiengesellschaft.

4. <u>Redemption</u>. The shares of Preferred Stock shall not be redeemable.

5. <u>Conversion</u>. No holder of shares of Preferred Stock shall have the right or option, at any time, to convert its shares of Preferred Stock into shares of Common Stock.

C. <u>Common Stock</u>. The powers and rights and the qualifications, limitations and restrictions of the Common Stock are as follows:

1. <u>Dividends</u>. Subject to the prior rights of holders of outstanding shares of Preferred Stock, the holders of the outstanding shares of Common Stock shall be entitled to receive when, as and if declared by the Board of Directors, out of the assets of the Corporation legally available therefor, such dividends as may be declared from time to time by the Board of Directors.

2. <u>Voting Rights</u>. Each outstanding share of Common Stock shall entitle the holder thereof to lifty (50) votes on all matters submitted to a vote of the stockholders of the Corporation.

3. <u>Liquidation Rights</u>. In the event of any Liquidation Event, after there shall have been paid in cash to the holders of the outstanding shares of Preferred Stock the full Aggregate Liquidation Amount, the holders of the outstanding shares of Common Stock shall be entitled to receive ratably all of the remaining assets of the Corporation available for distribution to its stockholders.

4. <u>Redemption</u>. The shares of Common Stock shall not be redeemable.

#### ARTICLE V

The number of directors of the Corporation shall be fixed from time to time by the Board of Directors of the Corporation.

#### ARTICLE VI

In furtherance and not in limitation of the powers conferred upon it by law, the Board of Directors of the Corporation is expressly authorized to adopt, amend or repeal the Bylaws of the Corporation.

#### ARTICLE VII

Unless and except to the extent that the By-laws of the Corporation so require, the election of directors of the Corporation need not be by written ballot.

#### ARTICLE VIII

A director of the Corporation shall not, in the absence of fraud, be disqualified by his office from dealing or contracting with the Corporation either as vendor, purchaser or otherwise, nor in the absence of fraud, shall any contract or other transaction of the Corporation be affected or invalidated in any way by the fact that any of the directors of the Corporation are in any way interested in or connected with any other party to such contract or transaction or are themselves parties to such contract or transaction: provided, however, that such interest and connection either shall be fully disclosed to a meeting of the Board of Directors, or of a committee thereof having authority in the premises, at which such contract or transaction is authorized, confirmed or approved, or shall at the time be otherwise known to the directors present at such meeting, and provided further that there shall be present at the meeting of the Board of Directors, or such committee, authorizing, confirming or approving such contract or transaction, and such contract or transaction shall be authorized, confirmed or approved by the vote of, directors not so interested or connected constituting a majority of the directors then in office No director of the Corporation shall be liable to the Corporation or to any stockholder or cteditor thereof or to any other person, for any loss incurred under or by reason of any contract or transaction of the Corporation, and no such director shall be accountable for any gains or profits realized therefrom. provided, however, that any such contract or transaction shall, at the time it was entered into, have been a reasonable one to have been entered into and shall have been upon terms that at the time were fair, and provided further that, if such director shall have

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been so interested or connected as to such contract or transaction, such contract or transaction shall have been authorized, confirmed or approved as aforesaid after the disclosure or knowledge of such interest or connection as aforesaid. A director of the Corporation shall not be deemed interested in or connected with a party to a contract or transaction between the Corporation and a parent, subsidiary or affiliated corporation by reason of the fact that he is also a director, officer or stockholder of such parent, subsidiary or affiliated corporation.

#### ARTICLE IX

No director of the Corporation shall be personally liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director, except for liability (i) for any breach of the director's duty of loyalty to the Corporation or its stockholders, (ii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) under Section 174 of the General Corporation Law of the State of Delaware, or (iv) for any transaction from which the director derived an improper personal benefit. Any repeal or modification of this Article by the stockholders of the Corporation shall be prospective only, and shall not affect, to the detriment of any director, any limitation on the personal liability of a director of the Corporation existing at the time of such repeal or modification.

#### ARTICLE X

Each person who is or was or had agreed to become a director or officer of the Corporation, and each such person who is or was serving or who had agreed to serve at the request of the Corporation as a director, officer, partner, member, employee or agent of another corporation, partnership, limited liability company, joint venture, trust or other enterprise (including the heirs, executor, administrators or estate of such person), shall be indemnified by the Corporation to the fullest extent permitted from time to time by applicable law.

IN WITNESS WHEREOF; the Corporation has caused its corporate scal to be hereunto affixed and this certificate to be signed by Joseph F. Harmett, Jr., its Vice President and Treasurer and attested by W. Timothy Pohl, its Vice President, General Counsel and Secretary, on this 20th day of June, 2003.

American Water Works Company, Inc. By

Vice President and Treasurer

(Corpersie Seal)

Attest: By:--W. Timothy Pehl

Vice President General Counsel and Secretary

## Exhibit E

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### Exhibit E Filings made or to be made with federal and state authorities

Fillings have or will be made with the following federal and state authorities before the proposed transaction can be consummated:

U.S. Securities and Exchange Commission

State of Delaware, Secretary of State

Arizona Corporation Commission<sup>1</sup>

California Public Utilities Commission

Hawaii Public Utilities Commission<sup>2</sup>

Illinois Commerce Commission

Kentucky Public Service Commission

Maryland Public Service Commission

New Jersey Board of Public Utilities

New Mexico Public Regulation Commission

New York Public Service Commission

Pennsylvania Public Utility Commission

Tennessee Regulatory Authority

Virginia State Corporation Commission

West Virginia Public Service Commission

<sup>&</sup>lt;sup>1</sup> Joint Petitioners believe that the proposed transaction is not normally regulated by the Arizona Corporation Commission, but filing will be made in the alternative and listing herein is without prejudice to such position.

 $<sup>^2</sup>$  Joint Petitioners believe the proposed transaction is not subject to the jurisdiction of the Hawaii Public Utilities Commission, but filing will be made in the alternative and listing herein is without prejudice to such position.



# Exhibit F

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## 617.20 Appendix C State Environmental Quality Review SHORT ENVIRONMENTAL ASSESSMENT FORM For UNLISTED ACTIONS Only

PART I - PROJECT INFORMATION (To be completed by Applicant or Project Sponsor)			
1. APPLICANT/SPONSOR	2. PROJECT NAME		
Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc.,	See attachment.		
American water works company, me, and poly and a stranger and poly			
S. Process See attachment.	County Nassau County		
Municipality occurrent and intermediate promitions	landmarks, etc. or provide map)		
4. PRECISE LOCATION (Street address and road whersections, prominent	stern area of Nassau County.		
Long Island water Corporation's service territory in the southwest			
18			
New Expansion Modification/alteration	on N/A		
6. DESCRIBE PROJECT BRIEFLY:			
See attachment.			
	2		
	72		
7. AMOUNT OF LAND AFFECTED:			
Initially N/A acres Ultimately N/A			
8. WILL PROPOSED ACTION COMPLY WITH EXISTING ZONING OR UT	HER EXISTING LAND USE RESTRICTIONS		
9. WHAT IS PRESENT LAND USE IN VICINITY OF PROJECT?			
Residential Industrial Commercial			
N/A			
1414			
10 DOES ACTION INVOLVE & PERMIT APPROVAL, OR FUNDING, N	OW OR ULTIMATELY FROM ANY OTHER GOVERNMENTAL AGENCY		
(FEDERAL, STATE OR LOCAL)?	117 - House and an		
Yes No If Yes, list agency(s) name and pe	ermivapprovais:		
Public Service Commission	Section 89-h Approval		
11. DOES ANY ASPECT OF THE ACTION HAVE A CURRENTLY VAL	D PERMIT OR APPROVAL?		
Yes No If Yes, list agency(s) name and pe	annivapprovais.		
N/A			
12. AS A RESULT OF PROPOSED ACTION WILL EXISTING PERMIT/	APPROVAL REQUIRE MODIFICATION?		
Yes ✓ No N/A			
I CERTIFY THAT THE INFORMATION PROVIDED	ABOVE IS TRUE TO THE BEST OF MIT KNOWLEDGE Date: 4/20/2006		
Applicanusponsol name.	12 S D I MATEL CORS		
Signature: h) ayu horgan	T DECUR DELIVERY LEDG VOLANG COM		
the second			
If the action is in the Coastal Area, and you are a state agency, complete the			
Coastal Assessment Form before proceeding with this decedement			



A. DOES ACTION EXCEED ANY TYPE I THRESHOLD IN 6 NYCRR, PART 6	17.4? If yes, coordinate the review process and use the FULL EAF.		
Yes No			
B. WILL ACTION RECEIVE COORDINATED REVIEW AS PROVIDED FOR U declaration may be superseded by another involved agency. Yes No	NLISTED ACTIONS IN 6 NYCRR, PART 617.67 If No, a negative		
C. COULD ACTION RESULT IN ANY ADVERSE EFFECTS ASSOCIATED W	ITH THE FOLLOWING: (Answers may be handwritten, if legible)		
C1. Existing air quality, surface or groundwater quality or quantity, noise to potential for erosion, drainage or flooding problems? Explain briefly:	avels, existing traffic pattern, solid waste production or disposal,		
C2. Aesthetic, agricultural, archaeological, historic, or other natural or cult	ural resources; or community or neighborhood character? Explain briefly:		
C3. Vegetation or fauna, fish, shellfish or wildlife species, significant habit	ats, or threatened or endangered species? Explain briefly:		
C4. A community's existing plans or goals as officially adopted, or a change in	use or intensity of use of land or other natural resources? Explain briefly:		
C5. Growth, subsequent development, or related activities likely to be indu	uced by the proposed action? Explain briefly:		
C6. Long term, short term, cumulative, or other effects not identified in C1	-C5? Explain briefly:		
C7. Other impacts (including changes in use of either quantity or type of e	nergy)? Explain briefly:		
D. WILL THE PROJECT HAVE AN IMPACT ON THE ENVIRONMENTAL CH/ ENVIRONMENTAL AREA (CEA)?	ARACTERISTICS THAT CAUSED THE ESTABLISHMENT OF A CRITICAL		
Yes No If Yes, explain briefly:			
E. IS THERE, OR IS THERE LIKELY TO BE, CONTROVERSY RELATED TO	POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS?		
PART III - DETERMINATION OF SIGNIFICANCE (To be completed by Agency) INSTRUCTIONS: For each adverse effect identified above, determine whether it is substantial, large, important or otherwise significant. Each effect should be assessed in connection with its (a) setting (i.e. urban or rural); (b) probability of occurring; (c) duration; (d) irreversibility; (e geographic scope; and (f) magnitude. If necessary, add attachments or reference supporting materials. Ensure that explanations contair sufficient detail to show that all relevant adverse impacts have been identified and adequately addressed. If question D of Part II was checked was the detail to show that all relevant adverse impacts have been identified and adequately addressed. If question D of Part II was checked			
Check this box if you have identified one or more potentially large or significant adverse impacts which MAY occur. Then proceed directly to the FULL EAF and/or prepare a positive declaration.			
Check this box if you have determined, based on the information and analysis above and any supporting documentation, that the proposed action WILL NOT result in any significant adverse environmental impacts AND provide, on attachments as necessary, the reasons supporting this determination			
	4/20/2006		
Name of Lead Agency	Date		
Print or Type Name of Responsible Officer in Lead Agency	Title of Responsible Officer		
Signature of Responsible Officer in Lead Agency	Signature of Preparer (If different from responsible officer)		

### PART II - IMPACT ASSESSMENT (To be completed by Lead Agency)

1

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#### NEW YORK PUBLIC SERVICE COMMISSION

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval Of The Merger of Thames Water Aqua US Holdings, Inc. With And Into American Water Works Company, Inc. and The Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

Case 06-W-\_\_\_\_

#### ATTACHMENT TO SHORT ENVIRONMENTAL ASSESSMENT FORM

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OF

#### THAMES WATER AQUA HOLDINGS GMBH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION

#### I. Introduction

The action at issue is the proposed (i) sale by Thames Water Aqua Holdings GmbH ("Thames GmbH") of up to 100% of the shares of common stock of American Water Works Company, Inc. ("American Water") in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of Thames Water Aqua US Holdings, Inc. ("TWAUSHI") with and into American Water, with American Water being the surviving corporation. As a result of this proposed transaction, American Water would become a publicly-owned utility holding company. There will be no impact to the outstanding common stock of Long Island Water Corporation ("Long Island Water"), which is currently owned by American Water and will continue to be owned by American Water after closing of the proposed transaction.

#### II. Background

Thames GmbH is a foreign corporation organized and existing under the laws of the Federal Republic of Germany. Thames GmbH's principal office is located at Opernplatz 1, 45128 Essen, Federal Republic of Germany. It is a wholly-owned subsidiary of RWE Aktiengesellschaft ("RWE"). Thames GmbH is the holding company for most of RWE's water operations, both in the United States and in several foreign countries.

TWAUSHI is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ

08043. TWAUSHI is a wholly-owned subsidiary of Thames GmbH. In turn, TWAUSHI is the direct parent company of American Water. TWAUSHI's subsidiaries now have approximately 7,000 employees and provide water, wastewater and other water resource management services to approximately 18 million customers in 29 states and Canada.

American Water is a corporation organized and existing under the laws of the State of Delaware, with its principal office located at 1025 Laurel Oak Road, Voorhees, NJ 08043. American Water owns regulated operating subsidiaries in 18 states. American Water does not conduct business in New York, nor is it authorized to do so.

Long Island Water is a wholly-owned subsidiary of American Water. It is a regulated water-works corporation organized and existing under the laws of the State of New York, with its principal office located at 733 Sunrise Highway, Lynbrook, New York. Long Island Water serves approximately 74,500 customers in southwestern Nassau County, New York. Long Island Water currently owns, operates and maintains potable water production, treatment, storage, transmission and distribution systems for the purpose of furnishing potable water for residential, commercial, industrial and governmental users in its service territory.

Thames GmbH proposes to sell up to 100% of the shares of common stock of American Water. The shares will be sold through one (or more, if necessary) underwritten public offerings to a broad group of investors, including institutional and retail investors. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange.

As a result of this transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after the proposed transaction.

#### III. Conclusion

1.1

The sale of up to 100% of the shares of common stock of American Water and the merger of TWAUSHI with and into American Water, immediately prior to the closing of the initial public offering, will have no environmental impact. There are no proposed operational changes for Long Island Water, which will continue to operate in accordance with all permits and certificates. The action at issue is merely a change in corporate ownership and structure.



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(SAPA No.

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## NYS DEPARTMENT OF STATE NOTICE OF PROPOSED RULE MAKING

#### PUBLIC SERVICE COMMISSION

NOTE: Typing and submission instructions are at the end of this form. Please be sure to COMPLETE ALL ITEMS. Incomplete forms and nonscannable text attachments will be cause for rejection of this notice.

Pursuant to the provisions of the State Administrative Procedure Act, (SAPA), NOTICE is hereby given of the following agency action:

#### 1. Proposed action:

. . .

The Public Service Commission ("Commission") is considering whether to approve or reject, in whole or in part, a joint petition of Thames Water Aqua Holdings GmbH ("Thames GmbH"), Thames Water Aqua US Holdings, Inc. ("TWAUSHI"), American Water Works Company, Inc. ("American Water"), and Long Island Water Corporation ("Long Island Water") for approval of (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of TWAUSHI with and into American Water, with American Water being the surviving corporation. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange. As a result of the proposed transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after the proposed transaction.

2. Statutory authority under which rule is proposed: Public Service Law, Section 89-h.

3. Subject of rule: Sale of stock.

4. **Purpose of rule**: To approve the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and the merger of TWAUSHI with and into American Water, immediately prior to the closing of the initial public offering.

5. Terms of rule: (Check applicable box):

[] The rule contains 2,000 words or less. An original copy of the text in scannable format is attached to this form.

- [] The rule contains more than 2,000 words. Therefore, an original copy of a summary of the text (in scannable format) is attached to this form.
- [X] Pursuant to SAPA Section 202(7)(b), the agency elects to print a description of the subject, purpose and substance of the rule containing less than 2,000 words. The original text in scannable format is attached to this form.

6. The text of the rule, regulatory impact statement and regulatory flexibility analysis may be obtained from:

Jeffrey Mills, Clerk II Three Empire State Plaza Albany, New York 12223 (518) 474-3204

7. Regulatory impact statement (check applicable box):

. . .

- [] A regulatory impact statement of 2,000 words or less is submitted with this notice.
- [] A summary of the regulatory impact statement is submitted with this notice because the full text exceeds 2,000 words.
- [] A consolidated regulatory impact statement is submitted with this notice because:
  - [] the rule is one of a series of closely related and simultaneously proposed rules.
  - [] the rule is one of a series of virtually identical ruled proposed during the same year.
- [] A regulatory impact statement is not submitted with this notice because this action is a technical amendment and, therefore, exempt from SAPA Section 202-a. Attached to this notice is a statement of the reason(s) for claiming this exemption.
- [] A regulatory impact statement is not submitted with this notice because this action is subject to a consolidated regulatory impact statement previously printed in the State Register under a notice of proposed rulemaking, ID No. <u>PSC-</u> Register date:\_\_\_\_\_.
- [X] A regulatory impact statement is not submitted with this notice because this action is a "rate making" as defined in SAPA Section 102(2) (a) (ii).

8. Regulatory flexibility analysis (check applicable box):

[] A regulatory flexibility analysis of 2,000 words or less is submitted with this notice.

- [] A summary of the regulatory flexibility analysis is submitted with this notice because the full text exceeds 2,000 words.
- [] A regulatory flexibility analysis is not submitted with this notice because this action will not impose any adverse economic impact on small businesses and will not impose any reporting, recordkeeping or other compliance requirements on small businesses. A statement is attached setting forth this agency's finding and the reasons upon which the finding was made, including what measures were used by this agency to ascertain that this action will not impose such compliance requirements, or adverse economic impact on small businesses.
- [X] A regulatory flexibility analysis is not submitted with this notice because this action is a "rate making" as defined in SAPA Section 102(2) (a) (ii).
- [] A consolidated regulatory flexibility analysis is submitted with this notice because this action is the first of a series of closely related rules that will be subject to the same analysis.
- [] A regulatory flexibility analysis is not submitted because this action is subject to a consolidated regulatory flexibility analysis that was previously printed in the State Register under a notice of proposed rule making, ID No. <u>PSC-\_\_\_\_\_;</u> Register date: \_\_\_\_\_\_.
- 9. Expiration date: (check only if applicable):

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- [X] This proposal will not expire in 180 days because it is for a "rate making" as defined in SAPA Section 102(2) (a) (ii).
- 10. Public Hearings (check box and complete as applicable):
  - [] A public hearing is required by law and will be held at \_\_\_\_a.m/p.m. on \_\_\_\_\_, 20\_\_\_, at \_\_\_\_\_.
  - [] A public hearing is not required by law, and has not been scheduled.
  - [] A public hearing is not required by law, but will be held at:\_\_\_\_, a.m./p.m. on \_\_\_, 20\_\_, at \_\_\_\_\_

- 11. Interpreter Services (check only if a public hearing has been scheduled):
  - [] Interpreter services will be made available to deaf persons, at no charge, upon written request submitted within a reasonable time prior to the scheduled public hearing. Requests must be addressed to the agency contact designated in this notice.
- 12. Accessibility (check appropriate box only if a public hearing has been scheduled):
  - [] All public hearings have been scheduled at places reasonably accessible to persons with a mobility impairment.
  - [] All public hearings except the following have been scheduled at places reasonably accessible to persons with a mobility impairment:
    - 1.

. **k**. , .

- 2.
- 3.
- [] None of the scheduled public hearing are at places that are reasonably accessible to persons with a mobility impairment.
- [] An optional explanation is being submitted regarding the nonaccessibility of one or more hearing sites.

13. Submit data, views or arguments to (complete only if different than previously named agency contact):

Hon. Jaclyn Brilling, Secretary Three Empire State Plaza Albany, New York 12223 (518) 474-6530

14. Additional matter required by statute:

[] Check box if not applicable.

15. Public comment will be received until:

- [] 45 days after publication of this notice (MINIMUM public comment period).
- [] 5 days after the last scheduled public hearing required by statute (MINIMUM, with required hearing).
- [] Other: (specify) \_\_\_\_\_.

Agency Certification (To be completed by the person who PREPARED the notice).

I have reviewed this form and the information submitted with it. The information contained in this notice is correct to the best of my knowledge.

I have reviewed Article 2 of the State Administrative Procedure Act and Parts 260 through 263 of 19 NYCRR and I hereby certify that this notice complies with all applicable provisions.

 Name
 Signature

 Address:
 Three Empire State Plaza
 Date

 Albany, NY 12223
 Telephone

Please read before submitting this notice:

+ W . 4

- 1. Except for this form itself, all text must be typed in scannable format as described in the Department of State's "NYS Register Procedures Manual."
- 2. Submit the original and six copies of this notice, properly collated: a) form; b) text or summary of rule; c) regulatory impact statement; and d) regulatory flexibility analysis.
- 3. This notice may be hand delivered or mailed:

a) Hand deliver or express mail to:

Register/NYCRR Unit, Department of State, 41 State St. (11th fl), Albany, NY (12207).

b) Address mail to:

Register/NYCRR Unit, Department of State, 162 Washington Avenue, Albany, NY 12231.

#### Substance of Proposed Rule

The Public Service Commission ("Commission") is considering whether to approve or reject, in whole or in part, a joint petition of Thames Water Aqua Holdings GmbH ("Thames GmbH"), Thames Water Aqua US Holdings, Inc. ("TWAUSHI"), American Water Works Company, Inc. ("American Water"), and Long Island Water Corporation ("Long Island Water") (collectively, the "Joint Petitioners") for approval of (i) the sale by Thames GmbH of up to 100% of the shares of common stock of American Water in one or more public offerings and (ii) prior to the closing of the initial public offering ("IPO"), the merger of TWAUSHI with and into American Water, with American Water being the surviving corporation. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange. As a result of the proposed transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after closing of the proposed transaction. According to the Joint Petitioners, the proposed transaction is in the best interest of the public, as well as the customers and employees of Long Island Water. As a publicly-traded company, American Water will be in a better position to maintain, develop and grow the water and wastewater business of its subsidiaries, including that of Long Island Water. Long Island Water will benefit under the improved operations of its parent company and, consistent with this Commission's policy goal of consolidating small water systems, continue to consider the strategic acquisition of surrounding water systems. The proposed transaction will have no impact upon the financial condition of Long Island Water, which will continue to provide safe, adequate and reliable service at just and reasonable rates in fulfillment of its obligations under New York State and federal law.

## LEBOEUF, LAMB, GREENE & MACRAE LLP

NEW YORK WASHINGTON, D.C. ALBANY BOSTON CHICAGO HARTFORD HOUSTON JACKSONVILLE LOS ANGELES PITTSBURGH SAN FRANCISCO

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99 WASHINGTON AVENUE SUITE 2020 ALBANY, NY 12210-2820 (518) 626-9000 FACSIMILE: (518) 626-9010 06-W-0490 OGC Gtw AtF 79012  $D^{\mu} + 9$ LONDON A MULTINATIONAL PARTNERSHIP PARIS BRUSSELS JOHANNESBURG (PTY) LTD. MOSCOW RIYADH BISHKEK ALMATY BEIJING Corvesp.

April 21, 2006

#### **BY HAND DELIVERY**

Honorable Jaclyn A. Brilling Secretary New York State Public Service Commission Three Empire State Plaza Albany, New York 12223-1350

> Re: Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval of the Merger of Thames Water Aqua US Holdings, Inc. With and Into America Water Works Company, Inc. and the Subsequent Sale of the Shares of the Common Stock of American Water Works Company, Inc.

Dear Secretary Brilling:

On behalf of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation, enclosed for filing please find an original and five (5) copies of a Short Environmental Assessment Form regarding the transaction in the above-referenced proceeding that is being filed simultaneously herewith under separate cover.

If you have any questions regarding this filing, please contact me.

Sincerely,

Blian J. Jitg Herald / clc

a .

Brian T. FitzGerald

BTF/cd (94751) Enclosures

cc: Michael Sgro

2006 APR 21 PM 3: 28

EXECEIVED COMMISSION COMMISSION EXEC-FLES-ALBANY

### 617.20 Appendix C State Environmental Quality Review SHORT ENVIRONMENTAL ASSESSMENT FORM For UNLISTED ACTIONS Only

Anulisant on Designt Changes

PART I - PROJECT INFORMATION (TO be completed by A		
1. APPLICANT/SPONSOR	2. PROJECT NAME	
hames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., See attachment.		
American Water Works Company, Inc. and Long Island Water Corporation		
3. PROJECT LOCATION:	N	
Municipality See attachment.	County Nassau County	
4. PRECISE LOCATION (Street address and road intersections, prominen	t landmarks, etc., or provide map)	
I ong Island Water Corporation's service territory in the southwe	stern area of Nassau County.	
Long Island Water Corporation & Service Correctly in an evaluation	· · ·	
•		
5. PROPOSED ACTION IS:		
New Expansion Modification/alterat	ion N/A	
6. DESCRIBE PROJECT BRIEFLY:		
See attachment.		
7. AMOUNT OF LAND AFFECTED: Initially N/A acres Ultimately N/A	acrés	
	THER EXISTING LAND USE RESTRICTIONS?	
9 WHAT IS PRESENT LAND USE IN VICINITY OF PROJECT?		
Residential Industrial Commercial	Agriculture Park/Forest/Open Space Other	
Describe:		
N/A		
10/11		
10. DOES ACTION INVOLVE A PERMIT APPROVAL, OR FUNDING, I	NOW OR ULTIMATELY FROM ANY OTHER GOVERNMENTAL AGENCY	
(FEDERAL, STATE OR LOCAL)?	armit/approvale:	
Yes No If Yes, list agency(s) hame and p	ennivappiovaia.	
Public Service Commission	Section 89-h Approval	
11 DOES ANY ASPECT OF THE ACTION HAVE A CURRENTLY VAL	ID PERMIT OR APPROVAL?	
Ves No If Yes, list agency(s) name and g	permit/approvals:	
100		
12. AS A RESULT OF PROPOSED ACTION WILL EXISTING PERMIT	/APPROVAL REQUIRE MODIFICATION?	
Yes Vo N/A		
I CERTIFY THAT THE INFORMATION PROVIDED	ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE	
Applicant/sponsor name: See response to Question 1 (above).	Date: 4/20/2006	
$\int -(h)$	VP Same De la france Lederer Coo	
Signature: hay horgan	TI DELVICE DELVERY LODG PSLAND WATTE CON	
If the attion is the the coast Area, ar	nd you are a state agency, complete the	
Coastal Assessment Form before	e proceeding with this assessment	
EXECUTER - MAN	MED	
NOISSIMMOD		
PUBLIC SERVICE	Reset	
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PARTIE- IMPACT ASSESSMENT (TO be completed by Leave	argeney		
A. DOES ACTION EXCEED ANY TYPE I THRESHOLD IN 6 NYCRR, PART	617.4? If yes, coordinate the review process and use the FULL EAF.		
B. WILL ACTION RECEIVE COORDINATED REVIEW AS PROVIDED FOR I declaration may be superseded by another involved agency. Yes No	UNLISTED ACTIONS IN 6 NYCRR, PART 617.6? If No, a negative		
C. COULD ACTION RESULT IN ANY ADVERSE EFFECTS ASSOCIATED W C1. Existing air quality, surface or groundwater quality or quantity, noise I potential for erosion, drainage or flooding problems? Explain briefly:	VITH THE FOLLOWING: (Answers may be handwritten, if legible) levels, existing traffic pattern, solid waste production or disposal,		
C2. Aesthetic, agricultural, archaeological, historic, or other natural or cul	Itural resources; or community or neighborhood character? Explain briefly:		
C3. Vegetation or fauna, fish, shellfish or wildlife species, significant habi	itats, or threatened or endangered species? Explain briefly:		
C4. A community's existing plans or goals as officially adopted, or a change i	in use or intensity of use of land or other natural resources? Explain briefly:		
C5. Growth, subsequent development, or related activities likely to be inc	duced by the proposed action? Explain briefly:		
C6. Long term, short term, cumulative, or other effects not identified in C	1-C5? Explain briefly:		
C7. Other impacts (including changes in use of either quantity or type of	energy)? Explain briefly:		
D. WILL THE PROJECT HAVE AN IMPACT ON THE ENVIRONMENTAL CHENVIRONMENTAL AREA (CEA)?	IARACTERISTICS THAT CAUSED THE ESTABLISHMENT OF A CRITICAL		
E. IS THERE, OR IS THERE LIKELY TO BE, CONTROVERSY RELATED TO Yes No If Yes, explain briefly:	O POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS?		
PART III - DETERMINATION OF SIGNIFICANCE (To be completed by INSTRUCTIONS: For each adverse effect identified above, determin effect should be assessed in connection with its (a) setting (i.e. urbs geographic scope; and (f) magnitude. If necessary, add attachmen sufficient detail to show that all relevant adverse impacts have been yes, the determination of significance must evaluate the potential imp	Agency) ne whether it is substantial, large, important or otherwise significant. Each an or rural); (b) probability of occurring; (c) duration; (d) irreversibility; (e nts or reference supporting materials. Ensure that explanations contair identified and adequately addressed. If question D of Part II was checked act of the proposed action on the environmental characteristics of the CEA		
Check this box if you have identified one or more potentially large or EAF and/or prepare a positive declaration.	significant adverse impacts which MAY occur. Then proceed directly to the FULL		
Check this box if you have determined, based on the information and analysis above and any supporting documentation, that the proposed action WILL NOT result in any significant adverse environmental impacts AND provide, on attachments as necessary, the reasons supporting this determination			
	4/20/2006		
Name of Lead Agency	Date		
Print or Type Name of Responsible Officer in Lead Agency	Title of Responsible Officer		
Signature of Responsible Officer in Lead Agency	Signature of Preparer (If different from responsible officer)		

#### SESSMENT (To be completed by Lead Agency)

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#### NEW YORK PUBLIC SERVICE COMMISSION

Joint Petition of Thames Water Aqua Holdings GmbH, Thames Water Aqua US Holdings, Inc., American Water Works Company, Inc. and Long Island Water Corporation For Approval Of The Merger of Thames Water Aqua US Holdings, Inc. With And Into American Water Works Company, Inc. and The Subsequent Sale Of The Shares Of The Common Stock Of American Water Works Company, Inc.

Case 06-W-

#### ATTACHMENT TO SHORT ENVIRONMENTAL ASSESSMENT FORM

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OF

#### THAMES WATER AQUA HOLDINGS GMBH, THAMES WATER AQUA US HOLDINGS, INC., AMERICAN WATER WORKS COMPANY, INC. AND LONG ISLAND WATER CORPORATION

#### I. Introduction

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#### II. Background

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Thames GmbH proposes to sell up to 100% of the shares of common stock of American Water. The shares will be sold through one (or more, if necessary) underwritten public offerings to a broad group of investors, including institutional and retail investors. The offering(s) will be conducted in accordance with the U.S. Securities Act of 1933, and the shares of common stock of American Water are intended to be listed on the New York Stock Exchange.

As a result of this transaction, American Water would become a publicly-traded utility holding company. There will be no impact to the outstanding common stock of Long Island Water, which is currently owned by American Water and will continue to be owned by American Water after the proposed transaction.

#### III. Conclusion

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The sale of up to 100% of the shares of common stock of American Water and the merger of TWAUSHI with and into American Water, immediately prior to the closing of the initial public offering, will have no environmental impact. There are no proposed operational changes for Long Island Water, which will continue to operate in accordance with all permits and certificates. The action at issue is merely a change in corporate ownership and structure.



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DPS Staff's First Set of Interrogatories and Con Edison's responses to DPS Staff's First Set of Interrogatories	
Letter dated February 6, 2006 revising Con Edison's responses to DPS Staff's First Set of Interrogatories	. 4
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## <u>Tab</u>

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Eric M. Dessen Associate Counsel

December 23, 2005

Steven Blow Assistant Counsel Public Service Commission Department of Public Service Three Empire State Plaza Albany, N.Y. 12223

> Case 05-T-1369 - In the Matter of the Application of Consolidated Edison RE: Company of New York, Inc. for a Certificate of Environmental Compatibility and Public Need under Article VII of the New York State Public Service Law for the Cedar Street Project.

Dear Mr. Blow:

Enclosed please find Con Edison's response to the Staff of the Department of Public Service's first set of discovery requests in the above-captioned proceeding.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Eric Dessen

enclosure

c: ALJ Leibschutz

#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

December 12, 2005

Request No.:

Edward Schrom, (518) 486-2890

Requested By: Date of Request:

Reply Date:

Witness:

Subject: Need

DPS-1

Provide the line loadings experienced on the existing 138 kV circuits for: the peak, off peak, and should *(sic)* peak. Include the mw and mvar flow on the cable.

Response to DPS-1:

## CEDAR St. 138 KV FEEDER FLOWS

138 kV Feeder Flows for Design Conditions (one transformer out of service)

	Summer 2006		Summer 2007	
Loading	Projected Peak (94 MW)	After transfer (87 MW) *	Projected Peak (97.MW)	After transfer (93 MW) **
MW	96	88	99	94
MVAR	45	33	50	43
AMPS	434	388	456	428
kV	140	140	140	140

	Winter 2005/06	Winter 2006/07	
Loading	Projected Peak (59 MW)	Projected Peak (61 MW)	
MW	60	62	
MVAR 24		26	
AMPS	264 .	275	_
kV 140		140	

_			
Spring 2006		Spring 2007	\
Loading	Projected Peak (56 MW)	Projected Peak (58 MW)	
MW	57	59	
MVAR	20	23	
AMPS	247	259	
kV	140	140	

Notes:

\* A temporary emergency load transfer to Washington St., of up to 7 MW in Summer 2006 will be implemented following the loss of one transformer at Cedar St., during peak load periods.

\*\* Only 4 MW of temporary emergency load transfer to Washington St. will be available for Summer 2007.

Name of Respondent \_\_\_\_\_\_ Jairo Gomez\_\_\_\_

Date of Reply <u>December 19, 2005</u>

#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:DPS-2Requested By:Edward Schrom, (518) 486-2890Date of Request:December 12, 2005Reply Date:Complement 12, 2005

Witness:

Subject: Need

Provide the winter and summer normal, LTE and STE ratings of the existing cables. How much different will the solid dielectric cable ratings be from those of the existing oil filled cables?

#### Response to DPS-2:

Please see the following table for the ratings. As discussed, the feeders are radial supplies and the normal and 300 hour LTE ratings have been provided. The limiting pieces of equipment on all the feeders are the 138/13 kV transformers at Cedar Street. The cables are not limiting and therefore do not affect the feeder ratings.

Feeder	Summer Normal Amps/MW	Summer 300 Hr LTE Amps/MW	Winter Normal Amps/MW	Winter 300 Hr LTE Amps/MW
38W03 or 38W04 HPFF	315 / 64	375 / 75	350 / 71	415 / 84
New 38W09T Solid Dielectric	305 / 60	375 / 75	395 / 80	480 / 100

Name of Respondent \_\_\_\_ Arnold Wong

Date of Reply \_\_\_\_\_ December 19, 2005 \_\_\_\_

#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:

Edward Schrom, (518) 486-2890

Requested By: Date of Request:

December 12, 2005

Reply Date:

Witness:

Subject: Need

DPS-3

Provide a circuit map showing how the Washington Street and Cedar Street Substations fit into the Con Ed system.

#### Response to DPS-3:

See Attachment DPS-3. Attachment DPS-3 contains highly sensitive and confidential information. It has been submitted in conjunction with a request for protection from disclosure in accordance with New York State Public Officers Law Section 87.2(f) and New York State Department of Public Service implementing regulations at 16 NYCRR Part 16.

Name of Respondent Michael Simione

Date of Reply December 19, 2005
Attachment DPS-3

Confidential

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:DPS-4Requested By:Edward Set

Edward Schrom, (518) 486-2890 December 12, 2005

Date of Request:

Reply Date: Witness:

Subject:

Provide a copy of the load flow studies done for this project.

Need

# Response to DPS-4:

Justification for the Cedar St. Project (installation of third transformer and 138 kV supply feeder) is based on substation transformer overload.

The capability of the substation is based on single contingency design criteria (one facility out of service).

The Cedar St. 138/13.8 kV transformers have a 300-hr summer capability of 87.3 MVA. A load of 87 MW (substation capability) at 0.89 pf = 87 MW + j 44.6 MVAR. With 40 MVAR of shunt capacitors at the distribution bus, the flow through the 13.8 kV side of the transformer is 87 MW + j 4.6 MVAR or <u>87 MVA which is the transformer capability</u>.

The current ten-year load forecast, updated on September 2, 2005, projects a 6megawatt overload, during first contingency conditions, on the remaining Cedar Street transformer in Summer 2007. Following the loss of one transformer at Cedar St., during Summer 2007 high load periods, a temporary emergency load transfer, of up to 4 MW to Washington St. could be implemented within one hour to decrease the Cedar St. load to 93 MW. With no other emergency load relief option available, the Cedar St. Substation could be subject to a 6 MW overload.

This load forecast and the substation loadings and capabilities are presented in Table E-4-3, of the Cedar Street Project Article VII application.

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:DPS-5Requested By:Edward Schrom, (518) 486-2890

Date of Request:

December 12, 2005

**Reply Date:** 

Witness: Subject:

Outage and repair times

Discuss the difference in repair times for solid dielectric cable vs an oil filled cable. –

## Response to DPS-5:

The dielectric fluid of fluid filled cables, LPOF or HPOF, directly impact the time required to locate feeder faults as well as increase repair times for handling the fluid. Fluid filled cable insulation is by nature partially self-healing when dielectric fluid flows back into a feeder fault creating a high resistance fault. As a result, the cable must be subjected to capacitor discharge to further break down the fault, establish a low resistance ground return path and allow radar and other fault locating techniques to work. The fault locating time for fluid filled cables is typically two to three days. Solid dielectric cables on the other hand fail catastrophically and establish an immediate low resistance fault path that enables the fault to be located typically within a day.

Once the fault is located on fluid filled systems, the fluid at the ends must be frozen and the fluid in the middle drained before repairs can proceed. The freezing requires excavation of pits and identification of the correct feeder before finally establishing a freeze. The damaged cables are removed and new cables and new joints are then installed. In most cases all three conductors must be replaced. New cable must then be properly re-pressurized before being subjected to proof testing. Typical repair times for HPFF cables are on the order of one month or longer.

Solid dielectric cables on the Con Edison system are installed as three individual phase conductors in a common steel pipe or individually in separate ducts. The number of damaged cables determines the repair time but in general a repair for a solid dielectric system will take one to two weeks to remove a manhole to manhole sections, install new cables and splice.

Name of Respondent \_\_\_\_Arnold Wong

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.: DPS-6

Requested By:

Edward Schrom, (518) 486-2890

Date of Request:

December 12, 2005

Reply Date:

Witness:

Subject: Need

Explain the note on E-4-3 "overloads in excess of 87 mw during a first contingency for summer 2006 will be relieved by temporary emergency load transfer to Washington Street."

## Response to DPS-6:

The projected Summer 2006 peak load for Cedar St. is 94 MW; the first contingency substation 300-hr capability is 87 MW and the 1.5-hr capability is 95 MW. If the load at Cedar St. exceeds 87 MW during a first contingency (one facility out of service), a sufficient amount of Cedar St. load can be temporarily transferred to Washington St. (Davenport 13 kV Loop) within one hour to bring the Cedar St. load down to 87 MW.

Date of Reply \_\_\_\_\_ December 19, 2005

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

<b>Request No.:</b>	DPS-7
Requested By:	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	•
Witness:	
Subject:	EMF

Provide the EMF calculations and input data used in computing the results. Include a description of all assumptions used in making the calculations.

### Response to DPS-7:

Table 4.10-1 of the Cedar Street Project Article VII application presented the results of its EMF analysis for the proposed feeder from the Washington Street Substation to the Cedar Street Substation. As indicated in §4.10.3 of the application, the analysis was based on the maximum capacity of the transformer of 80 MVA and 425 amperes of current in the circuits. The projected loading of the transformer has been reduced and, correspondingly, the amperes on the circuits have been reduced to 395 amperes. This represents the winter maximum normal feeder rating.

Part A of this response presents the EMF calculations and input data with these assumptions. We are presenting results for a 3-foot cover, as assumed in the filing, as well as a 2-foot cover.

Part B of this response presents the EMF calculations and input data for a second EMF analysis for the feeder. This is similar to the analysis presented in Part A, except that it assumes that the circuits operate at a winter normal conductor rating of 835 amperes.

Part C of this response presents the results of the Company's EMF analysis within the Cedar Street Substation. There are currently 2 transformers in service at the Cedar Street Substation. The analysis shows the impacts with 1 additional transformer (total of 3 transformers in service) and 2 additional transformers (total of 4 transformers in service) and the circuits operating at the winter normal conductor rating.

**Part A**: EMF Calculations based on the maximum capacity of the transformer of 80 MVA and 425 amperes of current in the circuits

The following assumptions were made when performing the EMF calculations:

- 1500 kcmil cable
- vertical configuration
- 10-inch vertical phase spacing (for 2 circuits, 16-inch horizontal circuit spacing)
- 1.3-inch conductor diameter & 3.8-inch shield diameter
- Winter normal feeder current of 395 Amps (see response to DPS-2)
- 2 or 3 ft. of cover
- calculations made at a height of 3.28 feet (1 meter) above ground level

	Number of 2		Circuit	MAGNETIC FIELD (mG)				
Case	Phase Circuits (3 Cables/CKT)	Number of Cables	Load per Phase (A)	Maximum (2 or 3 foot cover)	50 ft. from Center Line (2 or 3 foot cover)	Shield Ground		
	138 k	V supply to t	reet Substati	on				
1-a	1	3	395	87.1/65.4	1.5/1.5	SPB <sup>1</sup>		
1-b	1	3	395	1.6/1.3	0.04/0.04	MPB <sup>2</sup>		
2-a	2	6	395	34.8/22.8	0.8/0.8	SPB		
2-b	2	6	395	0.85/0.6	0.06/0.06	MPB		

Notes: <sup>1</sup>SPB – Single Point Sheath Bond

<sup>2</sup>MPB – Multi-Point Sheath Bond

The detailed results for each of the Cedar Street EMF calculations case in Part A are provided in the following attachments:

- Attachment DPS-7 Cedar Street EMF Calculations Part A Case 1a;
- Attachment DPS-7 Cedar Street EMF Calculations Part A Case 1b;
- Attachment DPS-7 Cedar Street EMF Calculations Part A Case 2a; and
- Attachment DPS-7 Cedar Street EMF Calculations Part A Case 2b

**Part B**: EMF Calculations assuming the circuits operate at a winter normal conductor rating of 835 amperes

The following assumptions were made when performing the EMF calculations:

- 1500 kcmil cable
- vertical configuration
- 10-inch vertical phase spacing (for 2 circuits, 16-inch horizontal circuit spacing)
- 1.3-inch conductor diameter & 3.8-inch shield diameter
- Winter normal conductor rating of 835 Amps.
- 2 or 3 ft. of cover
- calculations made at a height of 3.28 feet (1 meter) above ground level

			<b>O</b> : 1	MAGNETIC FIELD (mG)				
Case	Number of 3 Phase Circuits (3 Cables/CKT)	Number of Cables	Circuit Load per Phase (A)	Maximum (2 or 3 foot cover)	50 ft. from Center Line (2 or 3 foot cover)	Shield Ground		
	138	kV supply to	the Cedar	Street Substation	on			
1-a	1	3	835	184.1/138.3	3.11/3.1	SPB <sup>1</sup>		
1-b	1	3	835	3.5/2.6	0.08/0.08	MPB <sup>2</sup>		
2-a	2	6	835	73.7/48.2	0.17/0.17	SPB		
2-b	2	6	835	1.8/1.3	0.12/0.12	MPB		

Notes: <sup>1</sup>SPB – Single Point Sheath Bond

<sup>2</sup>MPB – Multi-Point Sheath Bond

The detailed results for each of the Cedar Street EMF calculations case in Part B are provided in the following attachments:

- Attachment DPS-7 Cedar Street EMF Calculations Part B Case 1a;
- Attachment DPS-7 Cedar Street EMF Calculations Part B Case 1b;
- Attachment DPS-7 Cedar Street EMF Calculations Part B Case 2a; and
- Attachment DPS-7 Cedar Street EMF Calculations Part B Case 2b

**Part C**: EMF Calculations within the Cedar Street Substation with 1 additional transformer (total of 3 transformers in service) and 2 additional transformers (total of 4 transformers in service) and the circuits operating at the winter normal conductor rating.

The detailed results for each of the Cedar Street EMF calculations in Part C are provided in the following attachments:

- Attachment DPS-7 Cedar Street EMF Calculations Part C 3 Transformers
- Attachment DPS-7 Cedar Street EMF Calculations Part C 4 Transformers

Attachment DPS-7 - Cedar Street EMF Calculations - - Part A - Case 1a





Title:

Cedar Street 138 kV solid dielectric cable , 1500 kcmil

User: Date: 12/19/2005 Time: 12:09pm Frequency: 60.0 Hz

Earth resistivity \_1000.000 Chm-m Multi-Grounded? y Shield currents known? N Sheath resistance 0.001 Chms/1000 ft

Chđ No. 01 02 03	X-Coord (in) 0.000 0.000 0.000	Depth (in) 42,000 52,000 62,000	Diame Cnd(in)S 1.300 1.300 1.300	ters hld(in) 3.800 3.800 3.800 3.800	Cond Amps 395.00 395.00 395.00	Angle Deg 0.0 -120.0 -240.0	Shield Amps ? ? ?	Arigle Deg ? ? ?
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CALCULATED MAGNETIC FIELD VALUES

X(ft)	mG	X(Et)	InG	X(ft)	nG.	X(ft)	mG	X(ft)	mG
-50.0	1.46	-30.0	3.90	-10.0	23.66	10.0	23.66	30.0	3.90
-49.0	1.52	-29.0	41.1.6	-9.0	26.90	11.0	20.87	31.0	3.67
-48.0	1.58	-28.0	4.44	-8.0	30.67	12.0	18.49	32.0	3.45
-47.0	1.65	-27.0	4.75	-7.0	35.01	13.0	16.46	33.0	3.26
-46.0	1.72	-26.0	5.09	-5.0	39.90	14.0	14.71	34.0	3.08
-15.0	1.80	25.0	5.47	~5.0	45.27	15.0	13.20	35.0	2.91
-44.0	1.88	24.0	589	-4.0	50.90	16.0	11.90	36.0	2.76
-43.0	1.96	-23.0	6.37	-3.0	56.36	17.0	10.77	37.0	2.62
-42.0	2.05	-22.0	6.89	-2.0	61.06	1.8.0	9.78	384.0	2.49
-41.0	2.15	-21.0	7.49	-1.0	64.28	1.9.0	8.92	39.0	2.37
-40.0	2.26	20.0	8.16	0.0	65.44	20.0	8.16	40.0	2.25
3.90	2.32	-19.0	8.92	1.0	64.28	21.0	7.49	410	2.15
-38.0	2.49	-18.0	9.78	2.0	61.06	22.0	6.89	42.0	2.05
-37.0	2.62	~17.0	10.77	3.0	56.36	23.0	6.37	43.0	1.96
-36.0	2.76	-16.0	11.90	4.0	50.90	24:0	5.89	44.0	1.88
-35,0	2.91	-15.0	13.20	5.0	45.27	25.0	5.47	45.0	1.80
34.0	3.08	-14.0	14.71	6.0	39.90	26.0	5.09	46.0	1.72
-33.0	3.26	-13.0	16.46	7.G	35.01	27.0	4.75	47.0	1.65
-32.0	3.45	-12.0	18.49	8.0	30.67	28.0	4.44	48.0	1.58
-31.0	3.67	-11.0	20.87	9.0	25.90	29.0	4.16	49.0	1.52

Cedar Street 138 KV Fades 395 Ampore 1'-(a) 2 Fait Cover 1'-(a) 7 - Feelus SPB

Emin; 1.470 Bmax; 87.124 100.000 mG -50 ft 50 ft

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Title: Cedar Strees 130 kV solid dielectric cable , 1500 kcmil

> User: Date: 12/21/2005 Time: 1:31 PM Frequency: 60.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Grounded? N Shield currents known? N

Cnd	X-Coora	Depth	Diame	ters	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)S	hld(in)	Amps	Deg	Ampis	Deg
01.	0.000	30.000	13.00	N/A	395.00	0.0	N/A	N/Ã
02	0.000	40.000	1.300	N/A	395.00	-120.0	N/A	N/A
03	0.000	50.000	1.300	N/A	395.00	-240.0	N/A	N/A

X(ft) -50.0 -49.0 -47.0 -65.0 -65.0 -65.0 -63.0 -42.0	mG 1.47 1.53 1.59 1.66 1.73 1.81 1.89 1.98 2.67	X(ft) -30.0 -29.0 -28.0 -27.0 -25.0 -25.0 -23.0 -23.0 -22.0	mG 3,98 4,27 4,27 4,27 4,27 4,27 5,27 4,57 5,52 5,52 5,52 5,52 7,08	X(ft) -10.0 -9.0 -8.0 -7.0 -6.0 -5.0 -4.0 -3.0 -3.0	mG 25.98 29.94 34.69 40.34 46.98 54.62 63.04 71.67 79.48	X(ft) 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0	mG 25.98 22.56 19.89 17.55 15.57 13.89 12.46 11.22 10.16	X(ft) 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0	mG 3.96 3.72 3.50 3.12 2.95 2.79 2.65 2.51	
-45.0 -46.0	$1.81 \\ 1.89$	-25.0 -24.0	5.59. 6.03	~5.0 -4.0	54.62 63.04	15.0 16.0	13.89 12.46	35.0 36.0	$2.95 \\ 2.79$	
-43.0 -42.0	1.98 2.67	-23,0 -22.0	6.52	-3.0 -3.0	71.67 79.48	17.0 18.0	$11.22 \\ 10.16$	37.0. 38.0	2.65 2.51	
~40.0 -39.0	2.27 2.39	-20.0 -19.0	8.42 9.23	-1.0 0.0 1.0	85.07 87.12 85.07	19.0 20.0 21.0	9,23 8,42 7,71	39.0 40.0 41.0	2.39 2.27 2.17	
38, 0 37, 0 361 0	2.51 2.65	-18.0 -17.0	10.15	2.0 3.0	79.43	22.0 23.0	7.08	42.0 43.0	2.07 1.98	
-35.0 -34.0	2.95 3.12	-16.0 -15.0 -14.0	13.89 15.57	5.0 6.0	54.62 45.98	24.0 25.0 26.0	5.59 5.19	$44.0 \\ 45.0 \\ 46.0$	1.69 1.61 1.73	
-33.0 -32.0 -31.0	3.30 3.50 3.72	-13.0 -12.0 -11.0	17.55 19.89 22.66	7.0 8.0 9.0	40.34 34.69 29.94	27.0 28.0 29.0	4.84 4.52 4.22	47-0 48.0 49.0	1.66 1.59 1.53	

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Attachment DPS-7 - Cedar Street EMF Calculations - - Part A - Case 1b

Case-1(b) Cedar Street 138 KU Feder 395 Ampere 395 Ampere 3feet cover

Bmin: 0.038 Bmax: 1.346

Title: Cedar Street 138 kV solid dielectric cable , 1500 kcmil

> User: Date: 12/19/2005 Time: 12:09pm Frequency: 60.0 Hz

Earub resistivity	1000.000	Ohm-m	
Multi-Grounded?	Ŷ		
Shield currents known?	N		
Sheath resistance	0.001	Onms/1000	ft

Cnđ	X-Coord	Depth	Diame	lers	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)Sh	ild(in)	Amps	Deq	Amos	Dea
01	0.000	42.000	1.300	3.800	395.00	0.0	?	2
02	0.000	52.000	1.300	3.800	395.00	-120.0	2	
03	0.000	\$2.000	1.300	3.800	395.00	-240.0	2	?

CALCULATED MAGNETIC FIELD VALUES

X(ft)	щG	X(Ett)	mC	X(F+)	ΠC	X(fr)	<del></del>	ソナチャッ	
-50.0	0.04	-36 6	0 07	-10 0	0 44	30.0	0 4 4	20.0	0.07
-69.0	0.04	299 6	0 09	10.0 C C	0.54	10.0	0.04	20.0	0.07
-48 0	0.04	.90 6	0.00	~>.0 © ^	0.01	11.U	9.33 0.07	31.0	- 0.07
- 47 0	0.04	-20.0 of ci	0.08	o.u	0.05	± 2 . 0	0.35	32.0	0.07
- 47.0	0.04	··· Z / . U	0.09	·· / . 0	0.66	33.0	J0.31	33.0	0.06
-46.0	0.04	-26.0	0.10	-6.Ü	0.75	14.0	0.28	34.0	0.06
-45.0	0.04	-25.0	0.10	5.0	0.86	15.0	0.25	35.0	0.06
-44.0	0.04	-24.0	0.11	-4.0	0.96	16.0	0.22	35.0	0.05
-43.0.	0.04	-23.0	0.12	-3.0	1.07	17 0	0.20	37.0	0.05
-42.0	0.04	-22.0	0.13	-2.0	1 16	18 0	0.20	35.0	0.05
-41.0	0.05	-21.0	0 14	-3 ()	1 22	10.0	0 17	20.0	0.05
-40.0	0.05	-20 6	0.15	0 0	3.722	20.0	0.1.7	29.0 48 0	0.05
	0.05	1.6 6	5 17	1 0	2.20	20.0	0.45	40.0	0.05
	0.000		9.17	1.0	2.24	21.0	0.14	41.0	0.05
-30.0	0.05	-18.0	5.78	2.Ç	1.16	22.0	0.13	42.0	0.04
-37.0	Ų.Ų5	-17.Ç	0,20	3.0	1.07	23.0	0.12	43.0	0.04.
-36.0	0.05	-16.0	0.122	G.O	0.96	24.0	0.1.1	44.0	0 04
-35.0	0.0S	-15.0	0.25	5.0	0.86	25.0	0.10	45 0	0 04
-34.0	0.06	-14.0	0.28	б.О	0.75	25 0	0 10	A6 0	0.04
-33.0	0.06	-13.0	0.31	7 0	0 66	27 0	0.10	47 0	0.04.
-32.0	0.07	~12.0	0.35	8.0	n 59	22.0	0.02	5.7.U	0.04
-31 6	0.07		0.00	0.0	0.00	20.0	0.00	48.0	0.94
04.0	0.07	-11.0	0.37	9.0	0.51	29.0	U.08	49.0	-0.04

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Cedar Shreef 138KV Feeder 395 Amperson 2 Feet Cover N. (b) 1 - Feeder MPB

.Rmax:1.655

50 ft

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2.000 mG

-50 ft

Bmin:0.038

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Title: Cedar Street 138 kV solid dielectric cable , 1500 kcmil

> User: Date: 12/21/2005 Time: 03:57pm Frequency: 60.0 Hz

Earth resistivity 1000,000 Ohm-m Multi-Grounded? Y Shield currents known? N Sheath resistance 0.001 Ohms/1000 ft

Crid	X-Coord	Depth	Diamet	ers	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)S?	nld(in)	Amps	Deg	Amps	Deg
01	0.000	30.000	1300	3.800	395.00	0.0	?	2
02	0.000	40.000	1.300	3.800	395.00	-120.0	?	?
.03	0.000	50.000	1.300	3.800	395.00	-240.0	?	2

X(ft) -50.0	mG 0 da	X(ft) -30_0	mC.	X(Et)	mG.	%(ft)	mG	X(ft)	mG
	0.04		0.0%	-10.0	0.43	11 0	0.69	20.0	0.07
- 48 0	0 04	-20.0	0.08	-9.0	0.50	1.1.0	0.62	27.0	0.07
-67 5	0.04	-27 0	0.00		6 76	12.0	0.07	22,0	0.07
44 5	0.04	0x 0	0.05	6 8	0.70	1.3.10	0.33	22.0	0.06
	0.404	-20.0	0.10	······································	0.00	14.0	0.29	34.0	0.06
~60.0	0.04	-20.0	0.10	- 5.0	1.05	15.0	0.26	33.0	0.06
~64.0	0.04	-24.0	42.11	-4.0	1.19	16.0	0.23	36.0	0.05
~63.0	0.04	-23.0	0.12	-3.0	1.36	17.0	0.21	37.0	0.05
-62.0	0.04	-22.0	0.13	-2.0	1.51	18.0	0.19	38.0	0.05
-41.0	0.05	-21:0	0.7.4	-1.0	1.62	19.0	0.17	39.0	0.05
-40.0	0.05	-20.0	0.25	0.0	1.66	20.9	0.16	40.0	0.05
-39.0	0.05	-19.0	0.17	1.0	1.62	21.0	0.14	41.0	0.05
-38.0	0.05	-18.0	0.19	2.0	1.51	22.0	0.13	42.0	0.04
37.0	0.05	-17.0	0.21	3.0	1.36	23.0	0.12	43.0	0 04
-36.0	0.05	-16.0	0.23	4.0	1.19	24.0	0.11	44 0	0 04
~35.0	0.06	÷-15.0	0.26	5.0	3.03	25.0	0 10	25 D	0.04
-34.0	0.06	-14.0	0.29	<b>6</b> .0	0.88	76.0	0.10	26 0	0.03
-33.0	0.06	-13.0	0 33	7 0	8 76	27 0	0.09	10.0	0.04
-32.0	0 07	-12-0	0 37	38.0	0 65	-28 0	0.00	47.0	0.04
-31 0	0 07		0 62	9 5	0 54	20,0	0.00	90	0.03
<u> </u>	X • V •	- 2 2 . 0	V. 84	.2.19	W	23,0	0.08	49.U	0.004

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Attachment DPS-7 - Cedar Street EMF Calculations - - Part A - Case 2a

(\_\_\_\_\_\_ ( ~ ) Ceder Steet 138 KV Feeder 395 Ampere 3 feet cover



Bmin:0.077

Title:

Cedar Street 138 KV cable , solid dielectric ,1500 kcmil

User: Date: 12/19/2005 Time: 12:38pm Frequency: 60.0 Hz

Earth resistivity Multi-Grounded?	1000.000 Ohm-m N	
Shield currents known?	N	

Cnd No. 01 02 03 04 05 06	X-Coord (in) -8.000 -8.000 -8.000 8.000 8.000 8.000 8.000	Depth (in) 42.000 52.000 62.000 42.000 52.000 62.000	Diame Cnd(in)S 1.300 1.300 1.300 1.300 1.300 1.300	ters hld(in) N/A N/A N/A N/A N/A N/A	Cond Amps 395.00 395.00 395.00 395.00 395.00 395.00	Angle Deg 0.0 -120.0 -240.0 -240.0 -120.0 0.0	Shield Amps N/A N/A N/A N/A N/A	Angle Deg N/A N/A N/A N/A N/A
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CALCULATED MAGNETIC FIELD VALUES

XIPHY	m	$X \in E + 1$	mC	アノデモン		71521	- 0		-
	0 00	-30 0	0.24	10 0	1163	ALECI	mG	A(EE)	πG
40.0	0.00	-30.0	9.04	-10.0	5.02	10.0	5.02	30.0	0.34
-49.0	0.08	-29.0	0.37	-9.0	6.09	11.0	4.16	31.0	0.31
-43.0	0.09	~28.0	0.41	-8.0	7.40	12.0	3.47	32.0	0.28
-47.C	0.09	-27.0	0.45	-7.0	9.02	13.0	2.91	33.0	0.26
45.0	0.10	-26.0	0.50	-6.0	10.97	1.4 ()	2 46	24.0	3 24
-45.0	0.10	~25.0	0.56	-5.0	13 23	15.0	2	28.0	0.24
-44.C	0.11	-24 0	0 82		15 74	75.0	2.07	33.0	5.ZZ
-43 0	0.10		0.02		10 70	10.0	1.79	210 - U	0.20
-45 0	0.10	~20.0	9.70	-3.0		J. 7 . G	1.54	37.0	0.18
	0.1.3	- 22 . U	0.79	-2.5	20.59	18.0	1.33	38.0	0.17
-4.1.0	0.1.4		0.89	-1.0	22.20	19.0	1.16	39.0	0.16
-40.6	0.15	-20.0	102	0.0	22.79	20.0	1.02	40.0	0.15
-39.0	0.16	-19.0	1.15	1.0	22.20	21.0	0.89	41 0	0 14
-38.0	0.17	-18.0	1.33	2.0	20.59	22.0	0.79	42.0 X2 0	0.19
-37.0	0.18	-17.0	1.54	3 0	18 30	23 0	0 70	32.0	0.10
-35.0	0 20	-16-0	70	A 0	16 74	20.0	0,70	4.2.0	0.12
.35 0	0.20	.15 0	5 09	91.0 5 0	10-76	24.0	0.62	44.0	0.11
-35.0	0.22	-10,V	2.09	5.0	13.23	25.0	0.56	45.0	0.10
- 04-0	0.24	-14.0	2.40	6.0	10.97	26.0	0.50	46.0	0.10
-3.3.0	Q.26	-13.0	2.91	7.0	9.02	27.0	0.45	47.0	0.09
-32.0	0.28	-12.0	3.47	8.0	7.40	28.0	0 41	68 0	0.00
-31.C	0.31	-11.0	4.15	9.0	5.09	29 0	0 37	<u>40</u> 0	0.00
				2.0	0.0./		0.21	19.7 - U	0.08

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Cedar Streed 138KV Feeder Tel (2) 395 Ampril Tel (2) 1 (oren: 2'-(a) 2 - Feeder SPB

Bmin: 0, 078 Bmax: 34.856 -50 ft

User: Date: 12/21/2005 Time: 2:22 PM Frequency: 60.0 Hz

Earth resistivity Multi-Grounded? 1000.000 Ohm-m N Shield currents known? N

Cnd No. 01 02 03 04 05 05	X-Coord (in) -8.000 -8.000 -8.000 8.000 8.000 8.000	Depth (in) 30.000 40.000 50.000 30.000 40.000	biame Cnd(in)S T.300 T.300 1.300 1.300 1.300	ters hld(in) N/A N/A N/A N/A N/A	Cond Amps 395.00 395.00 395.00 395.00 395.00	Angle Deg 0.0 -120.0 +240.0 -240.0 -120.0	Shield Amps N/A N/A N/A N/A N/A	Angle Deg N/A N/A N/A N/A N/A
0.6	8.000	50.000	1.300	N/A	395.00	0.0	N/A	N/A

X(ft) -50.0	mG 0.08	X(fb) -30.0	mG 0.34	X(ft) -10.0	mG 5,78	X(ft) 10.0	mG 5.78	X(ft) 30.0	ш© 0.34	
-49.0	0.08	~29.0	0.38	-9.0	7.15	11.0	4.71	31.0	0.31	
~47.0	0.09	-27.0	0.48	-70	11 37	12.0	3.81	32.0	0.29	
-46.0	0.10	-26.0	0.52	-6.0	14.02	14 0	3.63	3310	0.20	
-45.0	0.11	-25.0	0.58	-5.0	17.54	15.0	2.25	35.0	0.22	
-44.0	0.11	-24-0	0.65	-4.0	21.69	15.0	1.92	36.0	0.20	
-43.0	0.12	-23.0	0.73	-3.0	26.21	17.0	1.64	37.0	0.19	
-42.0	0.13	-22.0	0.82	-2.0	30.50	18.0	1.41	38.0	0.17	
-41.0	0.14	-21.0	0.93	-1.0	33.67	19.0	1.22	39.0	0.16	
~40.0	-0.10	-20.0	1.07	0.0	34.86	20.0	1.07	40.0	0.15	
~38.0	0.10		1.22	1.0	33.57	21.0	0.93	41.0	0.14	
	0.10	-13.0	2 4 4 3. 7 <b>6</b> 8	2.0	3.9.30	22.0	0.82	42.0	0.13	
-36 0	กว่อ	-16 0	1 00	1 0	20121. 01 60	43.0	0./3 0.cz	4.5.0	0.12	
-35.0	0.22	-15.0	2 26	5 N	7 52	24.0	0.00	44.0	0.11	
-34.0	0.24	-14.0	2.68	6.0	14.02	26.0	0.55	40.0	0 10	
-33.0	0.26	-13.0	3.21	7.0	11.17	27.0	0.46	47.0	0.09	•
3.20	0.29	-12.0	3.87	8.0	8.91	28.0	0.42	48.0	0.09	
-31.0	0.31	-13.0	4.71	9.0	7.15	29.0	0.38	49.0	0.08	
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# Attachment DPS-7 - Cedar Street EMF Calculations - - Part A - Case 2b

448 - 2 ( b) Ceder Street 138 KU Feeder 395 Ampere 3 feet rover



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Title: Cedar Street 138 kV cable ,solid dielectric ,1500 komil

> User: Date: 12/19/2005 Time: 12:38pm Frequency: 60.0 Hz

Earth resistivity Multi-Grounded?	1000.006 Y	Olua-m	
Shield currents known? Sheath resistance	N 0.001	0mms/1000	÷+
		014407100.0	

Cnd No. 01 02	X-Coord (in) -8.000 -8.000	Depth (in) 42.000 52.000	Diamet Cnd(in)Si 1.300 1.300	ters nld(in) 3.800 3.800	Cond Amps 395.00	Angle Deg 0.0	Shield Amps ?	Angle Deg ?	۰'
03	-8.000	62.000	1.300	3.800	395.00	-240.0	2	?	
05	8.000	52.000	1.300	3.800	395.00	-240.0 -120.0	· 2	? ?	
06	8.000	62.000	1.300	3.800	395.00	0.0	?	?	

#### CALCULATED MAGNETIC FIELD VALUES

$\begin{array}{cccccccccccccccccccccccccccccccccccc$	·X(ft)	mG	X(ft)	яG	X(Ét)	mС	X(ft)	mG	X(fr)	нG
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-50.0	0.06	-30.0	0.09	-10.0	0.24	10.0	0.25	30.0	0.09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-49.0	0.06	-29.0	0.09	-9.0	0.27	1, 1 + 0	0.23	31.0	0.09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-48.0	0.06	-28.0	0.09	-3.0	0.31	1.2.0	0.21	32.0	30.0
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-47.0	0.05	-27.0	0.10	-7.0	0.35	13.0	0.19	33.0	0.08
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	~46.0	0.05	-26.0	0.10	-5.0	0.40	14.0	0.18	34.0	0.08
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-45.0	0.06	-25.0	0.10	-5.0	0.45	15,0	0.17	35.0	0.08
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-44.0	0.06	-24.0	0.11	-4.Ŭ	0.51	16.0	0.16	36.0	0.08
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	43.0	0.06	-23.0	01.1.1	-3.0	0.56	17_0	0.15	37.0	0.07
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-42.0	0.07	-22.0	0.12	-2.Ŭ	0.59	18.0	0.14	38.0	0.07
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-41.0	0.07	-21.0	0.12	-1.0	0.6 <b>0</b>	1.9.0	0.13	39.0	0.07
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.07	-20.0	0.12	0.0	0.60	20.0	0.13	40.0	0.07
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	39.0	0.07	-19.0	0.13	1.0	6.62	21.0	0.12	41.0	0.07
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-38.C	0,07	-18.0	0.14	2.0	0.61	22.0	0.12	42.0	0.07
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-37.0	0.07	-17.0	0.14	3.0	0,58	23.0	0.11	43.0	0.06
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-36.0	0.07	-16.0	0.15	4.0	0.53	24.0	0.11	44.0	0.06
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-35.0	0.08	-15.0	0.16	5.0	0.48	25.0	0.10	45.0	0.06
33.0 0.08 -13.0 0.18 7.0 0.37 27.0 0.10 47.0 0.0 32.0 0.08 -12.0 0.20 8.0 0.32 28.0 0.09 48.0 0.0 -31.0 0.09 -11.0 0.22 9.0 0.29 29.0 0.09 49.0 0.0	-34.0	0.08	-14.0	0.17	5.0	0.42	26.0	0.10	46.0	0.06
-32.0 0.08 -12.0 0.20 8.0 0.32 28.0 0.09 48.0 0.0 -31.0 0.09 -11.0 0.22 9.0 0.29 29.0 0.09 49.0 0.0	33.0	0.08	-1.3.0	0.18	7.0	0.37	27.0	0.10	47.0	0.06
-31.0 0.09 -11.0 0.22 9.0 0.29 29.0 0.09 49.0 0.0	-32.0	0.08	-12.0	0.20	8.0	0.32	28.0	0.09	48.0	0.06
	-31.0	0.09	-11.0	0.22	9.0	0.29	29.0	0.09	49.0	0.06

Cedar Street 138KV Feeder Z (b) Z'-(b) 395 Amperes 2 Feet Cover 2 Feeder MPB



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User: Date: 12/21/2005 Time: 03:57pm Frequency: 60.0 Hz

Earth resistivity 1090.000 Ohn-m Multi-Grounded? Y Shield currents known? N Sheath resistance 0.001 Ohms/1000 ft

Cnd No. 01 02 03 04 05	X-Coord (in) -8.000 -8.000 -8.000 \$.000 \$.000 \$.000	Depth (in) 30.000 40.000 50.000 30.000 40.000	Biame Cnd(in)S 1.300 1.300 1.300 1.300 1.300	ters hld(in) 3.800 3.800 3.800 3.800 3.800 3.800	Cond Amps 39500 395.00 395.00 395.00 395.00	Angle Deg 0.0 -120.0 -240.0 -240.0 -120.0	Shield Amps ? ? ? ?	Angle Deg ? ? ? ?	
05	8.000	50.000	1.300	3.800	395.00	0.0	?	?	

((Ťti)	mG	X(ft)	mG	X (モヒ)	ING	X(ft)	mG	X(ft)	mG	
-500	0.06	~30.0	0.09	-10.0	0.25	10.0	0.26	30.0	0.09	
49.0	0.06	-29.0	0.09	- 9 - 0	0.28	11.0	0.24	31.0	0 09	
48:0	0.05	-28.0	0.09	- 8 . 0	0.33	12.0	0.21	32.0	6. 08	
47.0	0.06	-27.0	0.10	~7.0	0.39	13.0	0.19	22 0	6.08	
46.0	0.05	-26.0	0.10	-6:0	0.46	14.0	0.18	34.6	0.08	
45.0	0.06	~25.0	0.10	-5:0	0.54	15.0	0.17	25.6	0.08	
44.0	0.05	-24.0	0.11	-4.0	0.64	16.0	0.16	36.0	0.08	
-43.0	0,06	-23.0	0.11	-3,0	0.72	17.0	0.15	37.0	0.07	
42.0	0.07	-22.0	0.12	20	0.79	13.0	0.14	38.0	0.07	
41.0	9.07	-23.0	0.12	-10	0.81	1.9.0	0.13	39.0	0.07	
-40.0	007	-20.0	0.13	0.0	0.81	20.0	0.13	40.0	0.07	
-39.0	007	-19.0	0.13	1.0	0.85	21.0	0.12	41.0	9.07	
-38.0	0.07	-18.0	0.14	2.0	0.83	22.0	0.12	42.0	9.07	
-37.0	0.07	-17.0	0.14	3.0	0.76	23.0	0.11	43.0	0.06	
36.0	0.03	-16.0	0.15	4. Ū	6.67	24.0	0.11	66.0	0.06	
35.0	0.08	-15.0	0.16	5.0	0.57	25.0	0.11	65.0	0.05	
-34.0	0.08	-14.0	0.17	6.0	0.49	26.0	0.10	66.0	0.06	
-33.0	0.08	-13.0	0.18	7.0	0.41	27.0	0.10	47.0	0.06	
32.0	0.08	-12.0	0.20	8.0	0.35	28.0	0.10	48.0	0,06	
31.0	61.09	-11.0	0.22	9.0	0.30	29.0	9.09	49.0	0.06	
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Attachment DPS-7 - Cedar Street EMF Calculations - - Part B - Case 1a
Cedar Street 138 W Funder 835 Amp 2 feet cover 1 - Freder s p q



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Title: Cedar St. 138 kV 1500 komil solid dielectric cable: winter nor. co

> User: Date: 12/21/2005 Time: 10:09 AM Fréquency: 50.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Gröunded? N Shield currents known? N

Cnć No.	X-Coord (in)	Depth (in)	Diame Chā(in)S	ters hld(in)	Cond Amps	Arigle Deg	Shield Amps	Angle Deg
01	0.000	30.000	1.300	N/A	835.00	0.0	N/A	N/A
02	0.000	40.000	1.300	N/A	835.00	-120:.0	N/A	N/A
03	0,000	50,000	1.300	N/A	835.00	-240.0	N/A	M/A

$\mathbf{X}(\mathbf{ft})$	mG	X(ft)	mG	X(ft)	mG	X(ft)	mG	X(ft)	mG
-50.0	3.11	-30.0	8.37	-10.0	51.91	10.0	56.91	30.0	8.37
-49.0	3.23	-29.0	8.93	-9.0	63.30	11.0	47.91	31.0	7.86
-48.0	3.37	28.0	9.54	-8.0	73.33	12.0	42.04	32.0	7.40
-47.0	3.51	-27.0	10.22	~7.10	85.27	13.0	37.10	33.0	5.98
-46.0	3.66	-26.0	10.98	-6.0	99.31	14.0	32.92	34.0	5.59
-45.0	3.82	-25.0	11.81	~5.0	115.46	15.0	29.37	35.0	5.23
-44.0	3.99	-24.0	12.75	-3.0	133.25	16.0	26.34	35.0	5.90
-43.0	4.18	-23.0	13.79	-3.0	151.50	17.0	23.73	37.0	5.59
-42.0	4.37	-22.0	14.97	-2.0	168.02	18.0	21.47	38.0	5.34
-41-0	4.58	-21.0	16.29	-1.0	179.84	19.0	19:51	39.0	5.05
-40.0	4.81	-20.0	17.80	0.0	184.17	20.0	17.80	40.0	4.81
-390	5.05	-190	19.51	1.0	179.84	21.0	15.29	41.0	4.58
-38.0	5.31	-1.8.0	21.67	2.0	168.02	22.0	24.97	42.0	4.37
-37.0	5.59	-17.0	23.73	3.0	151.50	23.0	13.79	43.0	4.1.8
-36.0	5.90	-16.0	26.34	4.0	133.25	24.0	12.75	44.0	3.99
-35.0	6.23	-15.0	29.37	5.0	115.46	25.0	11.81	45.0	3.82
-34.0	6.39	-14.0	32.92	6.0	99.31	25.0	10.98	45.0	3.66
-33.0	6.98	-13.0	37.10	7.0	85,27	27.0	10.22	47.0	3.51
-32.0	7.40	-12.0	42.04	8.0	73.33	28.0	9.54	48.0	3,37
-37.0	7.36	-11.0	47.91	9.0	-63.30	29.0	8.93	49.0	3.23



Title:

Cedar St. 138 KV 1500 kcmil solid dielectric cable( winter nor. cond. rating)

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User: Date: 12/21/2005 Time: 09:25am Ffequency: 60.0 Hz

Earth resistivity 1000.006 Ohm-m Multi-Grounded? N Shield currents known? N

Cnd	Z-Coord	Depth	Diame	ters	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)S	hld(in)	Ampa	Deg	Amps	Deg
01	0.000	42.000	1.300	N/A.	835.00	0.0	N/A	N/A
02	0.000	52.000	1,300	N/A.	835.00	-120.0	N/A	N/A
03	0.000	62.000	1.300	N/A	835.00	-260.0	N/A	N/A

X(ft) 49.0 49.0 47.0 46.0 45.0 45.0	mG 3.21 3.35 3.49 3.54 3.59 3.59 3.79	X(ft) -30.0 -29.0 -28.0 -27.0 -26.0 +26.0 +24.0	8.25 8.79 9.38 10.04 10.76 11.57 12.46	X(It) -10.0 -9.0 -8.0 -7.0 -6.0 -5.0 -4.0	mG 50.01 56.87 64.84 74100 84.35 95.71 107.60	X(Et) 10.0 12.0 13.0 14.0 15.0 16.0	mG 50.01 44.13 39.10 34.79 31.09 27.90 25.15	X(ft) 30.0 31.0 32.0 33.0 34.0 35.0 36.0	00 8.25 7.75 7.30 6.89 6.51 6.51 6.16 5.84
-45.0 -44.0 -43.0	3.79	-25.0 +24.0	11.57 12.46	-5.0	95.71 107.60	15.0 16.0	27.90 25.15	35.0 36.0	6.16 5.84
-42.0	4.54 4.55	-22.0	13.46 14.57 15.83	-3.0 -2.0 -1.0	129.08	17.0 18.0 19.0	22.76 20.67 18.85	37.0 38.0 39.0	5.54 5.26 5.01
-20.0	s://	-20.0	17.25	0.0	138.33	20.0	17.25	400	4.77
-39.0	5.01	-19.0	18.85	1.0	135.89	21.0	15.63	410	4.55
-38.0	5.26	-18.0	20.67	2.0	129.08	22.0	14.57	420	4.34
-37,0	5.54	-17.0	22.76	3.0	119,15	23.0	$13.46 \\ 12.46 \\ 11.57$	43.0	4.14
-36.0	5.84	-16.0	25.15	4.0	107.60	24.0		44.0	3.96
-35.0	6.16	-15.0	27.90	5.0	95,71	25.0		45.0	3.79
-34.0	6.91	-14.0	51.09	6.0	8435	26.0	10.76	46.0	3.64
-33.0	6.89	-13.0	34.79	7,0	74.00	27.0	10.04	47.0	3.49
-32.0	7.30	-12.0	39.10	8.0	6484	28.0	9.38	48.0	3.35
-31.0	7.75	-11.0	44.13	9.0	56.87	29.0	8.79	49.0	3.35

Attachment DPS-7 - Cedar Street EMF Calculations - - Part B - Case 1b

Ce das Streit 138 KY Feider 835 Ambs 2 Feit Cover 1- Feider MPB



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Title: Cedar St. 138 kV 1500 kcmil solid dielectric cable( winter nor, co-

> User: Date: 12/21/2005 Time: 10:09 AM Frequency: 60.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Grounded? y Shield currents known? N Sheath resistance 0.001 Ohms/1600 ft

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Cud X-Coord	d Depth	Diame	ters	Cond	Angle	Shiela	Anale
No. (in)	(in)	Cud(in)S	ald (in)	Amps	Dea	Amos	Dea
0.1 0.000	30.000	1.300	3.800	835.00	0.0	2	205
02 0.000	40.000	1.300	3.800	835.00	-120.0	2	2
03 0.000	50.000	1 300	3 800	025. 60	240 0		2

$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	X(±t) -10.0 -9.0 -8.0 -7.0 -5.0 -4.0 -3.0 -2.0 -1.0 -2.0 -1.0 -2.0 -1.0 -2.0 -2.0 -2.0 -2.0 -3.0 -2.0 -3.0 -2.0 -3.0 -2.0 -5.0 -3.0 -5.0 -5.0 -5.0 -5.0 -5.0 -5.0 -5.0 -5	mG 1.03 1.18 1.37 1.60 1.87 2.87 2.87 3.12 3.45 2.87 3.45 2.87 3.45 2.87 1.60 7.1.87 1.60 7.1.87 1.38	X(1t) 10.0 11.0 12.0 13.0 14.0 15.0 15.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 25.0 27.0 28.0 29.0	mG 1.03 0.89 0.61 0.65 0.44 0.44 0.44 0.33 0.33 0.26 0.22 0.22 0.22 0.21 0.19 0.18 0.17	X(ft) 30.0 31.0 32.0 33.0 34.0 35.0 35.0 35.0 37.0 39.0 40.0 41.0 42.0 44.0 45.0 45.0 48.0 49.0	mG 0.16 0.15 0.14 0.13 0.13 0.12 0.11 0.11 0.11 0.11 0.10 0.10 0.09 0.09
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Title:

Cedar St. 130 KV 1500 kcmil solid dielectric cable ( winter nor. cond. rating)

User: Date: 12/21/2005 Time: 09:25am Frequency: 60.0 Hz

Eanth resistivity	1000.000	Óhm–m	
Kuiti-Grounded?	Ÿ		
Sheath resistance	م 0.001	Ohns/1000	ft.

Cnd	X-Coord	Depth	Diame	cers	Cond	Angle	Shield	Angle
No.	(in)	(in)	Cnd(in)S	ald(in)	Amos	Dea	Amos	Dec
01	9.000	42.000	1.300	3.800	835.00	0.0	3.	2
02	0.000	52.000	1.300	3.800	835.00	-120.0	?	2
03	9,000	62.000	1.300	3.800	835.00	-240.0	3	2

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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	X(Et) -50.0 -49.0 -48.0 -45.0 -45.0 -45.0 -44.0 -43.0 -42.0 -42.0 -40.0 -39.0	mG 0,08 0.08 0.08 0.09 0.09 0.09 0.09 0.09 0.	X(ft) -30.0 -29.0 -29.0 -27.0 -26.0 -25.0 -24.9 -23.0 -21.0 -21.0 -20.0 -19.0	mG 0.16 0.17 0.18 0.19 0.20 0.22 0.22 0.25 0.25 0.25 0.25 0.35	X(ft) -9.0 -8.0 -7.0 -6.0 -4.0 -3.0 -2.0 -1.0 1.0	6477299 9.02399 9.02399 1.02399 1.02399 1.02459 3.0245	X(ft) 10:0 11:0 12:0 13:0 14:0 15:0 15:0 17:0 18:0 19:0 20:0 21:0	mG 0.94 0.83 0.75 0.55 0.52 0.47 0.39 0.35 0.35 0.32 0.30	X(ft) 30:0 31:0 32:0 33:0 34:0 35:0 35:0 35:0 39:0 40:0	mG 0.16 0.15 0.14 0.13 0.13 0.13 0.13 0.12 0.11 0.11 0.10 0.10
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-45-0	0.09	-25.0	0.22	-5.0	1.81	15.9	0.52	35.0	0.12
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-43.0	6 69	-23-3	0.25	-4.0	2.04 1.22	10.0	0.47	36.0	0.11
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-42.0	609	-22.0	0.27	-2.0	2.45	18.0	0.30	37.0	0.11
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-41-0	0.10	-21.0	0.30	-1.0	2.59	19.0	0.35	39.0	-0.10
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-40.20	0.10	-20.0	0.32	0.0	2.63	20.0	0.32	40.0	0.10
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-39.0	0.10	-19.0	0.35	1.0	2.59	21.0	0.30	41.0	0.10
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	~30.10	0.11	~ . 0	0.35	2.0	2.45	22.0	0.27	42.0	0.09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-36.0	0.11	-16.0	0.47	2.0	2.40	2310	0.25	43.0	0.09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-35.0	0.12	-15.0	0.52	5.0	1.81	25.0	0 20	44.0	0.09
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-34.0	0.13	-14.0	0.58 -	6.0	1.59	25.0	0.20	46.0	0.05
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-33.0	0.13	-13.0	0.65	70	1.39	27.0	0.19	47.0	0.08
-51.0 0.15 $-11.0$ 0.83 9.0 1.07 29.0 0.17 49.0 0.08	-32,0	0.14	-12.0	0.73	8-, 0	1.22	28.0	0.18	48.0	0.08
	~51.0	0.15	-11.0	0.83	9.0	1.07	29.0	0.17	49.0	0.08

Cedar Street 138KV Feiders 835 Hander 2-Feeders. 2-Feeders. 5PB

2.400



Witle: Cedar Street 138 kv føeder,1500 kcmil - 2 circuits

> User: Date: 12/21/2005 Time: 03:07pm Frequency: 60.0 Hz

Earth resistivity 1000.000 Ohm-m Multi-Grounded? N Shield currents known? N

X(10) -48:0 -48:0 -42:0 -45:0	mG 0,17 0,17 0,19 0,21 0,22 0,22 0,22 0,22 0,22 0,22 0,22	X(ft) -29.0 -28.0 -27.0 -26.0 -25.0 -25.0 -25.0 -221.0 -221.0 -20.0 -18.0 -18.0	mG 0.73 0.80 0.88 0.98 1.09 1.237 1.54 1.97 2.25 2.59 2.59 3.47	X(ft) -10.0 -9.0 -7.0 -6.0 -7.0 -6.0 -4.0 -1.0 0.0 1.0 2.0 3.0	mG 12,12 15,12 18,64 23,61 29,64 37,08 45,64 55,44 55,44 71,16 71,18 71,18 71,18 55,40	X(Et) 10.0 11.0 12.0 13.0 14.0 15.0 15.0 15.0 15.0 15.0 15.0 20.0 20.0 21.0 22.0 23.0	mQ 12.22 9.96 8.18 6.79 5.67 4.06 7.86 7.86 7.86 7.86 7.99 2.52 2.29 2.29 1.54	X(ft) 30.0 31.0 32.0 33.0 34.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35	mG 0.73 0.60 0.55 0.47 0.43 0.43 0.43 0.33 0.33 0.29 0.29 0.26
-41.0 -39.0 -38.0 -37.0 -36.0 -35.0 -34.0 -33.0 -32.0	0.29 0.32 0.37 0.40 0.437 0.447 0.55 0.55 0.60	-21,9 -20.0 -19.0 -18.0 -17.0 -16.0 -15.0 -14.0 -13.0 -12.0	1,97 2,25 2,99 3,47 4,06 4,78 5,67 6,79 8,19	-1.0 5.0 2.0 3.0 4.0 5.0 5.0 7.0 8.0	71.18 73.68 71.18 64.47 55.40 45.86 37.08 29.64 23.61 18.84	19.0 20.0 22.0 23.0 24.0 25.0 25.0 25.0 25.0 25.0	2.59 2.25 1.97 1.76 1.37 1.22 1.09 0.98	39.0 40.0 41.0 42.0 43.0 45.0 46.0 47.0 48.0	0,34 0,29 0,27 0,26 0,22 0,22 0,22 0,21 0,20 0,19
-31.0	0.66	-11.0	9.96	9.0	15.12	29.0	0:80	49.0	0.17

Cedar Street 138KV Feeder 835 Amps 3-Feed Correr 2-Feeder MPB



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Title: Cedar Street 138 kv feeder,1500 kcmil - 2 circuits

> User: Date: 12/22/2005 Time: 3:13 PM Frequency: 60.0 Hz

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Earth resistivity	1000.000	Ohmeen	
Multi-Grounded?	X		
Shield currents known?	N		
Sheath resistance	0.001	Ohms/1000	ft

Cnđ	X-Coord	Depth	Diame	ters	Cond	Angle	Shield	Angle
NO.	(in)	(in).	Cnd (in) S	Shid(in)	Amps	Deg.	Amps	Deg
01	-8.000	42.000	1.300	3.800	835.00	0.0	2	<b>?</b> .
02	-8.000	52.000	1.300	3.800	835.00	-120.0	7	7
03	-8.000	62.000	1.300	3.800	835.00	-240.0	?	2
04	8.000	42.000	1.300	3.800	835.00	-240.0	?	?
05	8,000	52.000	1.300	3.800	835.00	-120.0	?	3.
06	8,000	62.000	1,300	3,800	835.00	0.0	?	?

)	X(ft) -50.0 -49.0 -48.0 -47.0 -45.0 -45.0 -45.0 -45.0		X(ft) -30.0 -29.0 -28.0 -27.0 -26.0 -25.0 -25.0 -24.0	mG 0.19 0.20 0.20 0.21 0.22 0.22 0.23	X(ft) -10.0 49.0 -8.0 -7.0 -6.0 -5.0 -4.0 -3.0	mG 0.51 0.64 0.74 0.84 0.96 1.07	X(ft) 10.0 12.0 13.0 14.0 15.0 16.0 17.0	mG 0.54 0.48 0.44 0.40 0.37 0.35 0.33 0.33	X(ft) 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0	mG 0.19 0.18 0.18 0.17 0.17 0.16 0.16 0.16
	-41.0 -40.0 -39.0	0.14 0.14 0.15	-21.0 -20.0 -19.0	0.25 0.26 0.27	-1.0 0.0 1.0	$1.27 \\ 1.28 \\ 1.31$	19.0 20.0 21.0	0.28 0.27 0.26	$39.0 \\ 40.0 \\ 41.0$	$0.25 \\ 0.14 \\ 0.14$
	-38.0 -37.0 -36.0	0.15 0.15 0.16	-18.0 -17.0 -16.0	0.29 0.30 0.32 0.32	3.0 3.0 4.0 5.3	1.30 1.23 1.13 1.01	22.0 23.0 24.0 25.0	0.25 0.24 0.23 0.22	42.0 43.0 44.0 45.0	$\begin{array}{c} 0.14 \\ 0.13 \\ 0.13 \\ 0.13 \\ 0.13 \end{array}$
	-34.0 -33.0 -32.0 -31.0	0.17 0.17 0.18 0.18 0.18	-14.0 -13.0 -12.0 -11.0	0.36 0.39 0.42 0.46	5.0 7.0 8.0 9.0	0.89 0.78 0.68 0.60	26.0 27.0 28.0 29.0	0.21 0.21 0.20 0.19	46.0 47.0 48.0 49.0	0.13 0.12 0.12 0.12 0.12

Attachment DPS-7 - Cedar Street EMF Calculations -- Part B - Case 2b

2'-(b)





Title: Cedar Street 133 kv feeder, 1500 Kcmil - 2 circuits

> Ušer: Date: 12/21/2005 Time: 03:07pm Frequency: 60.0 Hg

Earth resistivity 1000.000 Ohm-m Multi-Grounded? Y Shield currents known? N Sheath resistance 0.001 Ohms/1000 ft

X(ft)	mG	X(ft)	mG.	X(ft)	mG	X(ft)	mG	X(ft)	шG
-50.0	9.12	-30:0	0.19	30.0	0.53	10.0	0.55	30.0	0 10
-49.0	0.12	-29.0	0.19	-9.0	0.50	11.0	0.50	31 0	0.10
-48.0	0.12	-28.0	0.26	-8.0	0.70	1.2 . 0	0.45	30 0	a 1°C
-47.0	0.12	-27.0	0.21	-7.0	0.82	23.0	0.43	33 0	0.10
-46.0	0.13	-26.0	0.21	-6.0	0.97	1.4 .0	0.33	34.0	0 17
-45.0	0.33	-25.0	0.22	-5.0	1 35	35.0	0.35	35.0	0.17
-44.0	0.13	-24.0	0.23	-4 0	1 34	3.5 0	0.00	35.0	0.13
-43.0	0.14	-23.0	0.24	-3 0	1 53	17 0	0.00	20:0	0.10
-42.0	0.14	-22.0	0 25	-2.0	1 67	12.0	0.04	37.0	0.15
-41 0	0 14	-21 0	0.25	-1 0	1 72	10.0	9.50	38.0	0.15
-40.0	6 3.4	-20 0	0.20	-1.,0 n.n.	1 72	1.9.0	0.28	39.0	0.15
-30.0	A 14	10 0	0.27	1 . U	1.72	20.0	0.27	40.0	0.14
-55.0	10 J 2.12	-1.9.0	0.20	1.0	1.79	21.0	0.26	41.0	0.14
	0.10	-10.0	0.29	2.0	1.15	22.0	0.25	42.0	Q.14
-3.7.0	9.18	-1.(0	0:.30	3.0	1.61	23.0	0.24	43.0	0.14
-36.0	0.16	-16.0	0.32	4.0		24.0	0.23	44.0	0.13
-25.0	0.15	-15.0	0.36	5.0	1.21	25.0	0.22	45.0	0.13
-34.0	0.17	-14.0	0.36	6.0	1,03	26.0	0.21	46.0	0.13
-33.0	0.17	-13.0	0.39	7.0	0.87	27.0	0.21	47.0	0.12
32.0	0.18	-12.0	0.42	8.0	0.74	28.0	0.20	48.0	0 12
-31.0	0.18	-11.0	0.47	9.0	0.64	29.0	0.19	49.0	0 12
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Cedar Streef 138 KV Feedur



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Title: Cedar Street 138 hv feeder,1500 kcmil - 2 circuits

> User: Date: 12/22/2005 Thime: 3:13 PM Frequency: 60.0 Hz

Earth resistivity	1000.000 Ohm-m
Multi-Grounded?	N
Shield currents known?	V

Cnd	X-Coord	Depth	Diame	ters	Cond	Angle	Shield	Angle
NO.	(in)	(in)	Cnd(in)S	hid(in)	Amps	Deg	aqmA	Deg
01	-8.000	42,000	1.300	N/A	835.00	0.0	N/A	N/A
02	-8.000	52,000	1.300	N/A	835.00	-120.0	N/A	N/A
63	-8.000	62.000	1.300	M/A	835.00	-240.0	N/A	N/A
04	8.000	42.000	1.300	N/A	83500	-240.0	N/A	N/A
05	8.000	52.000	1.300	N/A	835.00	-120.0	N/A	N/A
<del>06</del> :	8.000	62.000	1.300	N/A	835,00	0:0	N/A	N/A

X(ft) -50.0	18G- 0.,16	X(Et) -30.0	mG 0.71	X(ft) -10.0	mG 10.61	X(ft) 10.0	mG 10 61	X(ft)	mG 0 70
-49.0	0.17	-29.0	0.79	-9.0	12.86	11.0	8.80	31.0	0.65
-47,0	020	27.0	0.85	-8.0	15.85 19.07	12.0 13.0	7.34	32.0	0.59
-46.0	0.21	-26.0	1.06	-6.0	23.18	14.0	5.20	34.0	0.50
-44.0	0.24	-23.0	1.18	-5.0 -4.0	27.97	15.0 16.6	4.42	35.0	0.46
-43.0	0.25	-23.0	1.48	~3.0	3.8.69	17.0	3.26	37.0	6.39
-41.0	0.29	-22.0	1.87	-2.0 -1.0	43.53	1.8. C 1.9. C	2.82	38.0	0.36
~40:0	0.31	-20.0	2.15	0.0	48.17	.20.0	2.15	40.0	0.31
-38.0	0.34	~12.0 ~18.0	2.80	2.0	46.94	21.0	1 67	61.0	0.29
-37.0	0.,39	-17.0	3.25	3.0	38.69	23.0	1.48	43.0	0.27
-36.0	0.42	-16.0	3.79 4.43	4.0	33.28	24.0	1.32	44.0	0.24
-34.0	050	-14.0	5.20	6.0	23.18	26.0	1.06	45.0	0.22
-33.0 -32.0	0.54	-13.0 -12 0	5.16 7 24	7.0	19.07	27.0	0.95	47.0	0.20
-31.0	0.65	-11.0	8,80	9.0	12,86	29.0	0.86 0.78	48.0 49.0	0.18 0.17

Attachment DPS-7 - Cedar Street EMF Calculations - Part C - 3 Transformers

Attachment DPS-7 - Cedar Street EMF Calculations - Part C - 4 Transformers

# Case 05-T-1369 Con Ed Cedar Street Project

## STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-8
<b>Requested By:</b>	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	
Witness:	
Subject:	Engineering Specifications

Provide a complete copy of all Con Ed's Substation and Engineering Department Engineering Design Guide Specification EI-2002 Rev 3, as specified on page 5-1 of the application.

# Response to DPS-8:

See attachment DPS-8, a copy of Con Edison's Standard Engineering Design Guidelines for Area Substations, Transmission Substations and Purs Facilities, CE-ES-2002 Revision 2. The attachment is the latest engineering specification for substations and supercedes EI-2002 Rev 3. The Company will follow CE-ES-2002 Revision 2 for the Cedar Street project. Attachment DPS-8

# CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. 4 IRVING PLACE NEW YORK, NY 10003

#### **ENGINEERING SPECIFICATION**

## CE-ES-2002

## STANDARD ENGINEERING DESIGN GUIDELINES FOR AREA SUBSTATIONS, TRANSMISSION SUBSTATIONS AND PURS FACILITIES

SECTION I GENERAL REQUIREMENTS

#### **REVISION 02**

#### NOVEMBER, 2005

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Prepared By:

Alan M. DeSimone, 11/9/2005 Name / Date

Approved By:

Bruce G. Horowitz, 11/15/05 Section Manager / Date



Page 1 of 34

ENGINEERING SPECIFICATION CE-ES-2002, SECTION I, GENERAL REQUIREMENTS NOVEMBER, 2005

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## ENGINEERING SPECIFICATION

#### CE-ES-2002, SECTION I, GENERAL REQUIREMENTS

#### NOVEMBER, 2005

#### 1.0 PURPOSE

- 1.1 The purpose of this Standard Engineering Design Guideline Specification is to establish the basic philosophy to be followed in the engineering and design of Consolidated Edison's area and transmission substations, henceforth called "Substations", and PURS Facilities.
- 1.2 The design criteria is specified herein to assure the uniform application of this design philosophy, thereby, insuring that the highest degree of reliability and "Environmental Excellence" consistent with sound engineering practices, economic guidelines, operating requirements, safety and environmental awareness are attained in the design and construction of the Company's substations and PURS Facilities.

#### 2.0 APPLICATION

- 2.1 This specification shall apply to the design of all new area and transmission substations and PURS Facilities and any modifications and/or extensions to existing facilities. However, it is not intended for use as part of any construction bid document.
- 2.2 When modifications and/or extensions are to be made to existing substations, and PURS Facilities emphasis shall be placed on maintaining and upgrading the already established physical design. Control and metering schemes shall follow the established pattern in that particular station in order to maintain uniformity and to facilitate the task of operating and maintaining that substation or PURS Facility.
- 2.3 Where feasible, modifications to existing substations or PURS Facilities should be brought up to the latest standards contained in this Design Guide, or the latest industry standards.

## 3.0 APPLICABLE STANDARDS AND REFERENCES

- 3.1 National Electric Code (NEC)
- 3.2 National Electric Safety Code (NESC)
- 3.3 Institute of Electrical and Electronics Engineers (IEEE)
- 3.4 National Electrical Manufacturer's Association (NEMA)
- 3.5 American National Standards Institute (ANSI)
- 3.6 Occupational Safety & Health Administration (OSHA)

#### 4.0 GENERAL DESIGN CRITERIA

- 4.1 General
  - 4.1.1 The general design of substations can differ greatly; depending largely on the conditions that must be met. The final design will depend on the following factors:
    - a. The terrain and topography of the site.

Page 3 of 34

Paper copies of the Engineering Operations Manual are uncontrolled and therefore may be outdated. Please verify that you have the current version prior to use by viewing the Central Engineering website (http://ceng/).

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# ENGINEERING SPECIFICATION CE-ES-2002, SECTION I, GENERAL REQUIREMENTS NOVEMBER, 2005

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- b. The size of the station including future expansion, i.e., number of feeder positions, transformers, etc.
- c. Transmission feeder point of entry (P.O.E.), types of transmission system, i.e., overhead or underground.
- d. Distribution feeder entry and outlet systems
- e. The medium of insulation, i.e., air or oil.
- f. Indoor versus outdoor installations
- g. The system voltage

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- 4.1.2 The physical design should arrange the electrical equipment as simply and economically as possible from a standpoint of reliability, operability, environmental excellence, constructability and maintainability; therefore, a number of different designs should be evaluated in order to select the most economically layout.
- 4.1.3 Table 1 is a checklist of items to be considered when designing an area substation.
- 4.1.4 Table 2 is the checklist of items to be considered when designing for transmission substations.
- 4.1.5 Table 3 is the checklist of items to be considered when designing PURS Facilities.

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# ENGINEERING SPECIFICATION CE-ES-2002, SECTION I, GENERAL REQUIREMENTS

NOVEMBER, 2005

#### TABLE 1

## CHECKLIST OF ITEMS FOR AREA SUBSTATION DESIGN

- o Primary and secondary voltage to be used
- o Substation MVA capacity, current and future
- o Future expansion needs
- MVA rating and short circuit rating (interrupting and close & latch rating)of switchgear

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- o Number of distribution feeder positions, initial and final.
- Size and layout of station property
- o Indoor vs. outdoor design
- o Maintenance requirements
- o Electrical clearances
- Light and Power requirements
- o Grounding Design
- o Control Room Layout
  - Cable and Trench Layout
- o Metering Scheme
- o Roadway Layout

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- o Primary and Secondary Voltage Relaying Schemes
- Aesthetic appearance of station
- Type of primary feeder cables
- o Alarm Panel Design and requirements
- One Line High Tension drawing
- o Accuracies of current transformers
- o Lighting Design
- Security Protection
- o Type of structure
- Routing of Metal Clad Bus
- Number and location of Capacitor Banks
- Type of Circuit Switchers and Interrupters (Interrupting Rating)
- Type of Metal Clad Switchgear
- o Environmental Aspects
- Transformer MVA rating and % Impedance
- o Phase Angle Regulators
- Series Reactors
- o Breaker and a Half Substations versus Ring Buses

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# ENGINEERING SPECIFICATION CE-ES-2002, SECTION I, GENERAL REQUIREMENTS

NOVEMBER, 2005

## <u> TABLE 2</u>

## CHECKLIST OF ITEMS FOR TRANSMISSION SUBSTATION DESIGN

- o Primary and secondary voltage to be used
- Substation capacity, current and future
- o Future expansion needs
- o BIL rating of Equipment
- o Number of transmission feeder positions, initial and final.
- Size and layout of station property
- o Air Insulated versus SF6 Bus (Momentary Rating of Bus)
- o Maintenance requirements
- o Electrical clearances
- o Light and Power requirements
- o Grounding Design
- o Control Room Layout
- o Cable and Trench Layout
- o Metering scheme
- o Roadway Layout
- o Primary and Secondary Voltage Relaying Schemes
- o Aesthetic appearance of station
- o Type of primary feeder cables
- o Alarm Panel Design and requirements
- o One Line High Tension drawing
- Accuracies of current transformers
- o Lighting Design
- Security Protection
- o Type of structure
- Number and location of Shunt Reactors
- o Environmental Aspects
- o Type of Circuit Switchers and Interrupters (Interrupting Rating)
- o Type of Metal Clad Switchgear
- Environmental Aspects
- o Transformer MVA rating and % Impedance
- Circuit Breaker (Continuous & Short Circuit Ratings)
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#### TABLE 3

#### CHECKLIST OF ITEMS FOR PURS FACILITIES DESIGN

- o Primary and secondary voltage to be used
- o Future expansion needs
- o MVA rating and short circuit rating (interrupting and close & latch rating) of switchgear.
- o Size and layout of station property
- o Indoor vs. outdoor design
- Maintenance requirements
- o Electrical clearances
- Light and Power requirements
- o Grounding Design
- o Control Room Layout
- Cable and Trench Layout
- o Roadway Layout
- Aesthetic appearance of station
- o Alarm Panel Design and requirements
- o One Line High Tension drawing
- o Lighting Design
- Security Protection
- Type of structure
- o Environmental Aspects
- 4.1.5 The final design should consider the possibility that any piece of equipment to be installed may fail. The equipment should be arranged so that such a failure will disrupt the station to the least possible extent and not jeopardize station nor system reliability. Particular attention should be made toward the space requirements for on-site repair, maintenance activities of existing equipment, or removal of any failed equipment.
- 4.1.6 A review shall be performed to determine the impact of a failure event (i.e.: explosion, fire, collapse of a structure, etc.) at all station areas to determine impact on equipment and operability on the continued operation of the facility and prevent a station shutdown.
- 4.1.7 The substation shall be designed to provide the normal full load power transfer capabilities under contingency conditions. The supply or transfer capability shall be consistent with the contingency design of the associated transmission feeders for a transmission substation or distribution networks for an area substation.
- 4.1.8 The aesthetic and environmental impacts of the new or modified substation and **PURS Facility** toward its surrounding area shall also be considered. Structural design, lighting, architectural treatments, landscaping, noise emission, pollution prevention techniques, etc. should be included in the engineering design and environmental review process. In addition, the substation and **PURS Facility**

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should present as low and inconspicuous a silhouette as possible, consistent with good engineering practices.

4.1.9 The overall design of the substation and PURS Facility shall be in accordance with this Standard Engineering Design Guideline. The components and systems shall meet and conform to all applicable ANSI, EIA, IEEE, IES, NEMA and OSHA standards, all federal, state and local environmental laws and regulations and all applicable Con Edison specifications and procedures.

#### 4.2 High Tension Operating Diagram

- 4.2.1 A first design step shall be the development of the High Tension Operating Diagram, i.e., a schematic representation of the substation using standard symbols to show all of the switching connections and all major pieces of equipment.
  - a. In order to prepare this diagram, the following design parameters are required and should be established in consultation with the Transmission Planning Department and the Substation Planning Section of the Distribution Engineering Department.
    - (1) The geographic location of the new substation or installation of new equipment within the existing substation.
    - (2) Any new or additional transfer capacity or loading requirements and the required voltage levels of the incoming transmission lines or outgoing distribution feeders, respectively.
    - (3) For transmission substations, the anticipated (maximum calculated) value of the short circuits and the maximum switching voltage surges which could be expected under normal operating conditions as well as contingency operating conditions.
    - (4) The final development and configuration of the substation.
- 4.3 Ratings
  - 4.3.1 The ratings of the required equipment is usually based upon normal loadings, load cycles, ambient service conditions and the life of the insulation. This information shall be obtained from the Equipment and Field Engineering Section and is based on ANSI Standards and Manufacturer's Data.
    - a. In general, equipment should be sized for continuous operation at the maximum continuous value specified by the manufacturer.
    - b. In order to provide a common set of guidelines for operation during contingency conditions, emergency ratings (time and current) are established for various equipment and conductors. The durations of these emergency ratings are based on an assumed life expectancy of the installation of 40 years. Emergency ratings are divided in two categories:
      - (1) Long Term Emergency Ratings (LTE)

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- (2) Short Term Emergency Ratings (STE)
- c. Long Term Emergency Rating is defined as a 4-hour rating by the New York ISO Committee on the Tie Line Ratings. For other components of the Con Edison System, the LTE rating is defined as a 3-hour rating. Short Term Emergency Rating is defined as a 15-minute rating by the New York ISO on Tie Line Ratings and 20 minutes for other components of the system. The STE conditions should not exceed an aggregate of 12½ hours over the life of the equipment. The LTE conditions should not exceed 300 hours.
- d. The equipment should, therefore, be selected to withstand the above contingency conditions.

#### 4.4 Reliability

- 4.4.1 All systems shall be designed such that a single failure of any component does not take out redundant systems. For example, the loss of one AC or DC Load Board does not prevent the loss of supply to a switchgear section or transformer.
- 4.4.2 All critical circuits and loads, i.e., relay protection circuits, supplies to switchgear sections, shall have automatic transfer switches to transfer the AC or DC supply to another source.
- 4.4.3 Transfer switches shall be separated from all other equipment.
- 4.4.4 AC Load Boards 1 and 2 shall be installed on opposite sides of the control room.
- 4.4.5 DC Load Boards 1 and 2 shall be installed on opposite sides of the control room.
- 4.4.6 One component failure shall not jeopardize the integrity of the substation or PURS Facility.

#### 5.0 SITE SELECTION AND TOPOGRAPHY

- 5.1 When a new substation or PURS Facility is being considered and the approximate location of the station has been established, a search for suitable properties in the general vicinity shall be conducted jointly by Central Engineering and Real Estate.
- **5.2** The new site shall be level, with good access roads nearby and preferably screened from public view by trees, terrain, other buildings, etc. The location, reliability considerations, and right of ways will determine if either underground or overhead feeders should be installed. For area substations, a site with access on three sides for outgoing distribution feeders is preferred.
- 5.3 In the event that the site mentioned above is not available, then the selection shall be based on an economic evaluation of the considerations listed below:
  - 5.3.1 A hilly site may require expenditures for grading the property, i.e., excavation or the possible filing of low areas may be required.
  - 5.3.2 Draining of the property may require extensive work, including an environmental site assessment and possible effluent discharge permitting.

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- 5.3.3 Towers may have to be located in places where it will be difficult to connect the conductors to the desired station bus.
- 5.3.4 When underground feeders must be installed, vehicle access for the cable transporting and pulling rigs must be provided.
- 5.3.5 The presence of rock or swamps may make the const of manholes and below grade trenches and conduits very high.
- 5.3.6 Access roads may have to be provided to existing public roads for the transportation of large equipment onto the site.
- 5.3.7 Extensive work may have to be done to provide containment facilities for any possible dielectric fluids spills where the site is located adjacent to sewers, rivers and brooks or other surface waters.
- 5.3.8 Site assessment studies and remediation efforts must be considered and costs evaluated for a site with a possible history of past contamination, and/or evidence that soil/ground water contamination exists.
- 5.3.9 The need for water may require the drilling of wells or long pipe runs to obtain water from a public source.
- 5.3.10 Extensive landscaping and Electric Magnetic Fields (EMF) studies may be required to satisfy public objections and EMF concerns.
- 5.3.11 Local codes, zoning laws, ordinances and permits must be studied to determine the cost associated with any special restrictions, which may be imposed. The Project Development and Standards Section of Central Engineering shall be consulted regarding these restrictions.
- 5.3.12 The differences in transmission and distribution costs because of location must be considered.
- 5.3.13 Overhead line crossings near the substation or PURS Facility should be avoided.

#### 6.0 FACILITY ARRANGEMENT

- 11

- 6.1 Transmission Substation Arrangement
  - 6.1.1 In addition to the size of the substation's property and the surrounding area, the substation arrangement shall be based upon the following criteria:
    - a. Whether the station's bus configuration shall be air or gas insulated, i.e., are circuit breaker bushings, potheads, surge arresters, transformer bushings, etc. to be air or gas insulated, the environmental concerns regarding the effect of Sulfur-hexafluoride (SF6), gas emissions on the environment should be considered.
    - b. Whether the station arrangement shall be "breaker-and-a-half," "single ring bus," "double ring bus" or other, this configuration shall be decided

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jointly by the Transmission Planning, Distribution Engineering (Substation Planning Section) and Central Engineering (CE) Departments.

- 6.1.2 An open air insulated bus configuration requires that the exposed conductors shall be separated from each other by a sufficient distance to permit the air to act as a dielectric which will withstand flashovers under the worst electrical and atmospheric conditions. Typically, this requires approximately ten times the amount of land area as that required for a gas insulated station.
- 6.1.3 In an open bus design, the conductors shall be supported on structures and insulators at a sufficient height above ground and away from structures (fences, buildings, etc.), to provide adequate ground clearances and safe distances to personnel (see Table No.4).

#### TABLE 4

### **OPEN BUS DESIGN - MINIMUM ELECTRICAL CLEARANCES - VERTICAL**

Within Substation Property	138 kV (750 BIL)	345 kV (1300 BIL)
Height of Low Bus (from grade)	17	23
Height of High Bus from grade)	27	. 38
Height of Bottom of Insulator, Lightning Arresters, Coupling Capacitor, etc. (from grade)	69740, ABAA 1	9(1)
Distance to live parts from grade or fence (fenced area)		
Equipment Access Roadway	5	9
Walkways	26	32
Buildings (with no roof access)	17	23
Clearance from Center of Conductor		
Building	20	32
Communication Cables	9	16
Distribution Cables	7	14
In Public Areas		
Height above Railroads Tracks	33	40
Height above Streets and Roadways	26	32

#### NOTE

- 1. See Paragraph 6.3.2
- 2. All clearances are in feet.
- 3. For new installations, the clearances for 138 kV shall be based on 650 BIL, however, where space is not of concern, the clearances for 750 BIL can be used for uniformity.

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- 6.1.4 Air insulated, metal clad buses have been used for voltage levels up to 138 kV. Regarding this type of construction (phase segregated or phase isolated type), the conductors are supported on spool type insulators and enclosed in metallic weatherproof enclosures.
- 6.1.5 The gas insulated bus design employs an inert gas, such as SF6, as the insulating medium. The advantage of this design is the greater degree of compactness which can be achieved, thus permitting the installation of the required equipment in a much smaller space, i.e., this type of design requires the least amount of area for a given configuration and is normally used at higher voltages.
- 6.1.6 For the gas insulated bus design, components such as potheads, surge arresters, coupling capacitors and transformer bushings are all provided with an SF6 atmosphere in a metallic enclosure. These metal-clad buses and equipment can be installed as closely together as good maintenance and construction practices permit.
- 6.1.7 The choice of substation arrangement shall depend upon the following issues:
  - a. Land availability

b.

- Whether overhead or underground feeders are being terminated
- c. Reliability requirements
- d. Economic constraints
- e. Environmental awareness and compliance to laws and regulations
- f. The "breaker-and-a-half" design utilizes three circuit breakers for every two transmission circuits or feeder positions. It offers a high degree of security because a faulted circuit will not affect the other operating sections of the station and two syn buses are available for power transfer (refer to Standard Drawing No. 303032, latest revision, for a typical one-line diagram). For detailed high tension drawings showing all ground switches, disconnect switches, etc. and the nomenclature for all equipment, refer to Drawing No. 303042, latest revision, "One Line Diagram of 138 kV or 345 kV Double Ring Bus High Tension Connections."
- g. The "ring bus" design requires only one circuit breaker per transmission circuit or feeder position and is, consequently, less costly. However, a double circuit outage may separate the load from the supply circuits. To avoid such a contingency, load circuits should be alternated with supply circuits, i.e., two tie feeders should not be installed adjacent to each other. Where alternate connections are not possible, the use of an additional circuit breaker (two breakers between the adjacent feeders) should be considered. This additional position could be used for a future load feeder (see Standard Drawing No. 303033, latest revision, for a typical one-line diagram). For detailed high tension drawings showing all ground switches, disconnect switches, etc. and the nomenclature for all equipment for all equipment, see Drawing No. 303043, latest revision, "One Line Diagram of 138 kV or 345 kV Double Ring Bus High Tension Connections."

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- 6.2 Area Substation Arrangement
  - 6.2.1 Depending on the size and shape of the substation property for an area substation, the transformers, switchgear sections and control room can be arranged in a variety of ways.
    - a. One arrangement suggests positioning switchgear sections side by side in a straight line with the corresponding transformers also arranged in a straight line (Bruckner, Plymouth Street).
    - b. The other typical arrangement suggests positioning the transformers on the outer perimeters of the property and the associated switchgear located in the interior of the property (i.e. East 40<sup>th</sup> Street).
  - 6.2.2 The area substation shall be designed as an indoor substation. All switchgear sections, battery rooms, test equipment, control room, shall be located in one control building with the latest substation reliability enhancements incorporated into this design.
  - 6.2.3 The standard 13 kV, 27 kV and 33 kV bus configuration for the area substation is the double syn bus design. This station bus arrangement utilizes two separately non-connected syn buses to connect the transformers. Each transformer is supplied from the bulk transmission network by a sub-transmission feeder cable.
    - a. Network load feeders are served from several bus sections with feeder placement balanced to provide diversity. The bus section then utilizes two normally closed circuit breakers as a means of supply (transformer and syn bus circuit breakers).
    - b. A maximum of four transformers are operated under load at any one time due to the short circuit capability of the switchgear. The fifth transformer is operated as a switchable in-place spare (refer to Standard Drawing No. 303034, latest revision, for typical one line diagram).
    - c. For detailed one-line high tension drawings showing all equipment and the nomenclature for equipment, refer to Drawing No. A247626, latest revision, for 138/13.8 kV substations and Drawing No. A247627, latest revision for 138/27 kV substations.
  - 6.2.4 The advantage to the double syn bus design lies in the fact that two separate sources are available to supply the load bus sections. If the transformer or feeder is out of service the section will be supplied via its syn bus and vice versa.
- 6.3 Electrical Clearances

6.3.1 As stated in Paragraph No. 6.1.5, the gas-insulated station can be installed with a minimum amount of space between equipment except for passageways and maintenance areas. However, open-air type bus arrangements require that adequate electrical clearances be provided between live parts, live parts and ground, and live parts and structures over and above those required passageways and maintenance.

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6.3.2 In a "ring-bus" design, the main bus runs are placed as close to the ground level as possible. The taps leading to the transformer or feeder terminals are then located at a higher elevation. This configuration is used in order to keep the cost of the circuit breaker foundations and the bus and disconnect switch supports at a minimum. A tabulation of the minimum design bus elevations is provided in Table No. 4. The minimum phase-to-phase and phase to ground spacing is provided in Table No. 5.

#### TABLE 5

#### **OPEN BUS DESIGN – MINIMUM ELECTRICAL CLEARANCES**

	72.5 kV (350 BIL)	138 kV (750 BIL)	345 kV (1300 BIL)
Phase to Phase	3 Feet 0 Inches	8 Feet 0 Inches	15 Feet 0 Inches
Phase to Ground	2 Feet 1 Inch	5 Feet 0 Inches	9 Feet 0 Inches

- NOTE
- 1. The phase-to-phase clearance at terminals (bushings) of transformers and circuit breakers is less than the values specified above. Therefore, the spacing of bus which connects to these terminals shall be expanded to the above distances as close to the unit as physically possible.
- 2. For 138 kV and 345 kV installations when necessary, the clearances can be reduced to correspond to 650 BIL and 1050 BIL respectively with the approval of the Chief Engineer, Central Engineering.
- 3. All clearances are in feet.
- 6.3.3 In a "breaker-and-a-half" design, the bay buses are placed as close to the ground as possible and the "Syn" (common) buses are located at a higher elevation. Again, this is done to minimize circuit breaker foundation and support structure costs.
- 6.3.4 All surge arresters, potential transformers, coupling capacitor potential (voltage) transformers, coupling capacitor potential devices, etc., having a clearance of less than that indicated in Table 4, between the bottom of the insulator stack and grade (for both the 138 kV and 345 kV installations) shall be enclosed within an individual or common, 6 foot high fence enclosure.
- 6.4 Control House

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6.4.1 A central control building (outdoor design) or a central control room (indoor design) shall be provided for each substation and PURS Facility. The use of a centralized control location will permit a more rapid response by the substation operator to alarms and automatic operations (during attended operation) thereby shortening the restoration time following "trip-outs."

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- 6.4.2 The control house shall contain the following equipment and be sized accordingly:
  - a. All protective relaying system panels and cabinets, the first line equipment shall be installed on one side of an aisle or walkway, and the second line equipment on the other side.
  - Alarm monitoring system, fire alarm controls panel, local control panel, digital fault recorder, SER, supervisory control and telemetering cabinets, etc. These components shall be centrally grouped for efficient viewing, use and operation by the substation operator.
  - c. Lighting panels, AC and DC panel boards, rectifiers, static invertors, etc.
  - d. All communications facilities i.e., radio transceiver and control console, telephones, telephone termination boxes and interface equipment, etc.
- 6.4.3 For the area substation, in addition to the above mentioned equipment, the control room shall also contain the following:
  - a. Network startup/shutdown panel
  - b. Voltage reduction panel
    - Load shedding panel

c.

- d. Load Management System Panel This panel shall be installed for all new installations. It combines the voltage reduction panel and load shedding panel into one panel.
- 6.4.4 The control house shall include two separate battery rooms, one for Battery No. 1 and one for Battery No. 2.
- 6.4.5 Locker, washroom and lavatory facilities should be included.
- 6.4.6 Sufficient space for the future installation of protective relaying and control equipment to accommodate the ultimate, planned development of the substation or PURS Facility shall also be provided.
- 6.4.7 The control house shall be constructed either with a "pedestal" type (floating) floor to facilitate cabling and equipment installation and relocation or with trenches. Overhead tray systems should be considered for modification or renovation works in an existing control room. Fire protection facilities and barriers to maintain primary and back-up protective relay system cable separation shall be installed. The following are the advantages of the installation of a floating floor:
  - a. Cable installation is simplified through the utilization of all available space under the floor.
  - b. Cable replacement is possible, since most cables will be installed next to each other rather than on top of the other.
  - c. Fire protection between first and second line cabling is achieved via the installation of fire retardant barriers underneath the floor tiles.

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- d. Cabling for an added piece of equipment is easily accomplished.
- e. The installation cost has to be compared with that of concrete trenching before the final selection of one system over the other.
- 6.4.8 Two individual, physically separated cable entrances (conduits or trench) shall be provided into the control house for the primary and back-up protective relaying system cabling. In addition, two physically separate conduit entrances shall be provided for the Route No. 1 and Route No. 2 telephone cables or fiber optic cables.

#### 7.0 STRUCTURAL REQUIREMENTS

- 7.1 Insulation Coordination
  - 7.1.1 The insulation strength of the electrical equipment designed and installed in a substation must be coordinated with the expected electrical stresses; i.e., the magnitude, duration and probability of internally generated over-voltages (due to switching surges) and externally (due to lightning strikes, power crosses, faults, etc.) generated over-voltages; and the characteristics of the surge protective devices to be installed.
  - 7.1.2 In order to provide an equal basis for coordinating the insulation of various electrical equipment, the insulating strength of each device is specified, based on its ability to withstand an over-voltage under certain specific conditions. This rated withstand voltage level is referred to as the "Basic Lightning Impulse Insulation Level" (BIL) of the equipment.
  - 7.1.3 The BIL rating of a piece of equipment is determined and established by Con Edison and verified by the manufacturer by performing specific factory tests. These tests include a full wave voltage impulse test, where the test wave shall have a virtual front time (based on the full wave impulse voltage) equal to or less than 1.2 microseconds and a time to the 50 percent value of the test voltage equal to or greater than 50 microseconds. The crest magnitude of the full wave impulse voltage which is successfully "withstood" is the BIL rating of the device.
  - 7.1.4 The required insulating strengths for substation equipment in terms of standard BIL levels is given in Table No. 6. Selection of a higher BIL should be justified on an individual basis.

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#### TABLE 6

#### TRANSMISSION SUBSTATION SURGE ARRESTER RATINGS

Equipment to be protected	<u>138 kV</u>	<u>345 kV)</u>
Bus	120 (1)	312
Switchgear	120 (1)	312
Transformer		
1050 kV BIL Internal	120 (1), (3)	312
900 kV BIL Internal	120 (1), (3)	312
550 kV BIL Interna!	120 (1), (3)	276 (2)

#### NOTE

- 1. In specific locations 144 kV rated arresters may be used
- 2. In specific locations 312 kV rated arresters may be used if the protective margin is satisfactory.
- 3. For Delta connected windings, if the primary can be isolated from the effectively grounded 138 kV system, 144 kV rated arresters shall be used.
- 4. The ratings for the Surge Arresters are in kV, line to ground.
- 7.1.5 In order to limit the surge voltages that may be imposed on the equipment and safely bypass these over-voltage surges to ground, surge protectors (surge arresters) are installed in the substation. In addition to bypassing any surges which may develop, these devices should be able to withstand the rated maximum voltage without discharge. The ratio of the maximum surge voltage, it will discharge without failure to the maximum crest voltage it will withstand.
- 7.1.6 The surge protectors shall be coordinated with the substation's BIL levels and shall have a protective margin of 20% minimum. They shall be installed as close as possible to the equipment being protected.
- 7.1.7 It should be noted that surge arresters are not designed to protect against direct high energy lightning strikes at the substation terminations. These devices are designed to handle voltage surges entering the substation due to switching operations in other parts of the system or from lightning strikes on the "high line" several tower sections away from the substation.
- 7.1.8 Since the BIL levels for the transformers and the remainder of the station equipment can vary, the surge arresters for the transformers should be mounted on the transformers (or as close as possible to them) with the ratings shown in Table 6. When the surge arresters are used to protect other equipment (such as circuit breakers, buses, potential transformers, etc.) a different rating should be selected. These are also shown in Table No. 7.

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#### **TABLE 7**

	138	l kV	345 kV	
Equipment	Internal	External	Internal	External
Transformer and Shunt Reactors	550	650	1050	1175
Circuit Breakers	650 (1)	650	1300 (1)	1175
Potential Transformers	550	650	1175	1175
Coupling Capacitor Potential Devices	-	650	-	1550 (2)
Terminals (Potheads)	-	650 (3)	-	1300 (3)
Disconnect Switches	-	650	-	1300
Bus Supports	-	650	-	1300
Shunt Capacitor Banks	(4)	650	(4)	1300

#### BIL RATINGS OF MAJOR TRANSMISSION SUBSTATION EQUIPMENT

#### NOTE

الحجو والرواح والأمجوا الأليك 1. The internal BIL may vary on gas circuits breakers, depending on the pressure and temperature of the interrupting medium.

. . . . . . .. . . .

- This is an industry standard, different BIL ratings can be obtained at extra cost. 2.
- This BIL is required to protect the high pressure, pipe type cables. 3.
- Shunt capacitor banks are built from smaller capacitor units grouped on racks. 4. The BIL refers to the complete rack assembly.

5. The BIL Level Ratings for Surge Arresters are in kV.

1.14 1.14

7.1.9 Protection against temporary overvoltages may require special surge arresters. Transient Network Analysis studies should be performed to determine the type and/or number of surge arresters to be installed where the potential for switching over voltages exists, which can lead to failure of standard surge arresters.

#### 7.2 Bus and Supporting Structures

- 7.2.1 As a preference, all buses shall be rigid-type, mounted on ground supported structures with supporting steel below the insulators.
- 7.2.2 Strain type buses can be used where economically justified.

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- 7.2.3 Short flexible links or bus expansion connectors shall be utilized as connections to all apparatus terminals and equipment (i.e. potheads, arresters, etc.), where possible. This should prevent any lateral stress from being passed on to the pothead or other terminal thus mitigating any dielectric fluid leaks or SF6 gas emissions to the environment as well as equipment operating problems (disconnect misalignments).
- 7.2.4 The bus should be designed and installed in the recommended arrangements shown on Standard Drawing Nos. 303035, 303036 and 303037, latest revisions. All installations shall be designed with B-phase as the center phase.
- 7.2.5 All supporting structures shall have a minimum of bracing. Lattice type structures shall be avoided because of their unsightly appearance. Each supporting structure design shall be arranged for a maximum clearance under the structure to allow for the installation of any future equipment.
- 7.2.6 The rigid bus conductors shall be tubular aluminum; ANSI Schedule 40 or Schedule 80, ALCOA Aluminum Alloy 6063-T6 or equivalent and be capable of sufficient current carrying capacity. The standard bus size is 4" Outer Diameter (OD) for 138 kV and 5" O.D. for 345 kV. For long runs, the recommended sizes are 5" O.D. and 6" O.D. respectively. The spacing of the support insulators shall be determined by the short circuit stresses imposed on the conductors combined with an assumed wind and ice load. The design should accommodate the following momentary and short circuit current values:

Short Circuit Current	138 kV	345 kV
Momentary (3 Phase)	100 kA	100 kA
Short Circuit (3 Phase)	63 kA	63 kA

The wind and ice loading conditions are listed in Specification No. CE-TS-13 "Structural Design for Substation Supporting Structures." The value shall be selected from Chapter 3.0 Design Loadings.

7.2.7 The bus conductors shall be welded (inert gas, heliarc welding) except where the buses are to be connected to the equipment. All such connections shall be bolted with everdur (silicon-bronze), high strength aluminum alloys, or stainless steel hardware.

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#### TABLE 8

#### MAXIMUM VIBRATION-FREE SPAN LENGTH TABULAR BUS

Nominal Pipe Size	Maximum Safe Span Length
1	5' - 0"
1¼	6' - 3"
1½	7' - 0"
2	9' - 0"
21/2	10' – 9"
3	13' – 3"
31/2	15' – 3"
4	17' – 0"
41/2	19' – 0"
. 5	21' – 3"
6	25' – 3"
•	

1. Lengths based on one loop of vibration

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- 2. Lengths apply to both Schedule 40 and Schedule 80 tabular bus.
- 3. Lengths can be increased approximately 20% with reasonable certainty that there will be no vibration.
- 7.2.8 Whenever bus spans exceed the lengths given in Table No. 8, inner aluminum tubing for vibration damping should be considered. The recommended dampers are ALCOA internal bus dampers. As an alternative to the ALCOA bus dampers, the following sizes of ACSR multi-strand core conductors shall be inserted in the tubular bus:

	TABLE 9
Bus Size (inches)	Recommended Minimum Size ACSR (Circ. Mills)
3	266,800
31/2	397,500
4	795,000
5	1,431,000
6	1,590,000

The inner aluminum tube lining shall be free to rotate. The bus liner shall be made of 6063-T6 aluminum alloy or equivalent. The following table gives the details of all sizes of bus required:

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		TABLE 10		
	r (Inches			
Nominal Bus Size (Inches/Schedules)	Bus O.D.	Bus I.D.	Liner O.D.	Liner Wall Thickness (Inches)
4/40	4.500	4,026	3.750	0.0625
4/80	4.500	3.826	3.750	0.0625
5/40	5.563	5.047	4.500	0.0625
5/80	5.563	4.813	4.500	0.0625
6/40	6.625	6.065	5.000	0.0625
6/80	6.625	5.761	5.000	0.0625

- 7.2.9 Generally, mid-span bus splices are to be avoided. If this is not possible, cast aluminum alloy couplers must be used (similar to H.K. Porter Type WS) to join the conductors. These couplers must be welded to the bus.
- 7.2.10 Bus supporting points and the use of various type (rigid, sliding, flex or expansion) connectors should be carefully selected and should include allowance for future bus expansion.
- 7.2.11 Bus connectors and supports should be of the "Corona Free" design. They should be made of cast or forged aluminum alloy, and its strength shall not be less than ALCOA Aluminum Alloy 195-T4.
- 7.2.12 Connections to surge arresters, potential devices or coupling capacitors shall normally be via short length, flexible connectors. Where flexible connections cannot be used, minimum 2.5 inch O.D., SPS Aluminum Alloy 6063-T6 pipes can be used with provisions for expansion (sliding or expansion connectors). The surge arresters shall not be used as bus supports.
- 7.2.13 When aluminum hardware is being furnished, it shall be coated with a No. 205 aluminate finish. Bolts and nuts shall be Aluminum Alloy 2024-T4 or equivalent. The torque values for the various bolt sizes shall be:

	<u>TABI</u>	<u>.E 11</u>	
Bolt Size	Threads/Inch (National Coarse Class 2 Fit)	Torque (Ft/Lbs)	Ultimate Tensile Load (Lbs)
3/8	16	11	4,300
1/2	13	23	8,000
5/8	11	50	12,000
3/4	10	70	19,200

- 7.2.14 All surfaces, bolts, nuts and washers are to be coated with an anticorrosive lubricant such as NO-OX-ID, grade A special or equivalent.
- 7.2.15 For existing 138 kV installations, either cap and pin type insulators or outdoor post type insulators should be used to match the existing insulators. For new installations, station post type insulators should be used. The flashover

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characteristics must conform to the BIL selected for other equipment, See Table No. 12. Extra creepage distance shall be specified for all insulators.

#### **TABLE 12**

#### TRANSMISSION SUBSTATION INSULATORS

		138 kV			345 kV	
Type Insulator	No.	BIL	Bolt Circle	No.	BIL	Bolt Circle
Cap & Pin	4	750	5"	-	-	-
Post	1 or 2	750	5"	3 or 4	1300 (1)	5" or 7"
Suspension (5¾" x 10" Discs)	7 to 12	760 to 930	-	16 to 29	1350-1615	
Strain (5¾" x 10" Discs)	7 to 12	<sup>·</sup> 1200	-	16 to 29	1350	-

#### NOTE

1. The size of the bolt circle depends on the cantilever strength of the insulator.

- 2. The number of disc depends on the type of insulators selected for the application. In polluted areas, special long leakage distance insulators shall be specified. It is recommended that at least one extra disc be used in each string above the number required to obtain an impulse flashover value equivalent to the BIL of the substation (e.g. 9 insulators at 138 kV). In existing substation, use the same type and number of insulators as the insulators already installed.
- 7.2.16 For 345 kV installations, only post type insulators should be used. The insulator strength will be determined by the combined short circuit, wind and ice load.
- 7.2.17 The supporting insulators should be specified for vertical, under-hung or 45° cantilevered mounting depending on the design of the station and where they shall be used.
- 7.2.18 When a set of three bus support insulator stacks (one per phase) are to be installed "in line," as a general rule, they shall be mounted on a common, double support stand.
- 7.2.19 For 345 kV disconnect switch insulators, an insulator strength higher than normally provided for supports may be required because of the added stress imposed by the operation of these disconnect switches. The required insulator strength shall be verified by calculation.
- 7.2.20 The supporting structures and stands for the disconnect switches, surge arresters, coupling capacitors, insulators, etc. shall be fabricated from structural shapes of galvanized steel. These structures should be pre-assembled by the fabricator to the maximum extent, consistent with shipping and erection

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limitations. Structural members should be welded, except for bolted mounting of the appurtenances to be supported.

- 7.2.21 All structures shall be self supporting with a minimum of cross-bracing and be fabricated of hot galvanized steel. Lattice type structures shall be avoided because of their unsightly appearance. None of the structural members shall have a thickness of less than 0.250 lnches.
- 7.2.22 All disconnect switch supporting structures shall be uniform in design for the low and high bus, respectively.
  - a. The disconnect switch structure design, as a general rule, shall have space, openings and factory drillings provided for the future installation of ground switches on both terminals, if they are not initially provided. Initial ground switch requirements shall be indicated on the one-line diagram.
  - b. The structural design shall allow a maximum amount of clear space beneath the structure.
  - c. For the 138 kV disconnect switch assemblies, the minimum vertical clear space beneath the supporting stand shall be:
    - (1) 9 ft. 0 inch. for the low bus of 17 ft. height.
    - (2) 20 ft. -0 inch. for the high bus of 27 ft. height.
  - d. For the 345 kV disconnect switch assemblies, the minimum vertical clear space beneath the supporting standard shall be:
    - (1) 11 ft. -0 inch. for the low bus of 23 ft. height.
    - (2) 26 ft. 0 inch. for the high bus of 38 ft. height.
- 7.2.23 All pothead stands shall be designed to accommodate one pothead per phase (see the latest revision of Standard Drawing No. A167904, for 138 kV installations and Drawings No. A168009, for 345 kV installations). If double potheads are required for specific 138 kV terminations, such a requirement will be specified by the Transmission Planning Department, the minimum clearance of 5' 0" between phase and ground shall be maintained for 138 kV equipment. All pothead stands shall be uniform in design and shall be provided with a platform on the top of the stands for personnel access and maintenance.
  - a. For the 345 kV pothead stands, the platform shall extend on all sides, a minimum of three feet from the centerline of each pothead. This platform should accommodate and support a temporary installation of three field erected, air conditioned housings around the potheads for the maintenance and preparation of the pothead cable terminations. Drawing No. A166333, latest revision, shows the field erected humidity chamber.
  - b. Each pothead stand shall be equipped with a set of sleeves, capable of accepting a set of removable posts and safety railings. These railings will be temporarily mounted on the pothead platform to insure the safety

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of Company personnel while they are working on the pothead structure (See Standard Drawing No. 303038, latest revision). A minimum of one set of removable railings shall be required for each station. These railings shall meet OSHA standards.

See Table 13 for a list of standard drawings for other structures, i.e., disconnects switch stands, surge arrester stands, etc.

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### **TABLE 13**

## ALL STATION REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
A159080	Assembly of Standard 138 kV Double Pothead Structure
A159887	Details and General Notes for Cable Troughs
162474	Current Transformers At 138 kV And 345 kV Potheads
167934	Schematic Diagram Of Typical Tap Changer Control For Large Power Transformers
166215	Typical Method For Installing Kellum Grips On Potheads
166333	Humidity Chamber For 345 kV Potheads
167901	Nitrogen Cabinet
167902	Assembly Auto Valve Cabinet For Circulating Oil High Pressure Feeders
167904	Assembly of Standard 138 kV Single Pothead Structure and Electrolysis
167912	Assembly and Details of Station Alarm Panel
167913	Assembly and Detail of Station Shut-Down and Re-Energization Control Panel
167927	Fill Unit And Cabinet For Nitrogen Gas Storage
167929	Diagram of Connections for Station Shut Down and Re-Energization Panel
167933	Diagram of Connections for Transformer Fire Protection Equipment in Fire Pump Room and Deluge Valve Enclosure
167934	Schematic Diagram of Typical Tap Changer Control for Large Power Transformers
167935	Typical Schematic Wiring for Oil Insulated Transformer Cooling Equipment
A167942	Assembly Of 125 Volt DC Load Board – Substation
A167945	Assembly Of 48 Volt DC Load Board – Substation
A167958	Aluminum Structure For 138 kV Auto Ground Switch
167975	Schematic Of Circuit Breaker, Disconnect Switch, PAR Or Transformer Tap Changer Auto/Manual Control And Indication
167991	Typical Schematic Piping Diagram for a Pressurization Plant
A168009	Assembly Of Standard 345 kV Pothead Structure Substations
168491	Installation of Thermocouples for Oil Circulating Pipes on Feeders
177608	Block Diagram Of S/S Transformer Remote Manual Control Of Voltage Reduction
181895	Typical Ground Connections For Electrical Equipment And Structures In Area Substations
185773	Diagram Of Connections For Transformer Fire Protection Single Pipe System
190950	Relay Board Nameplates
211226	345 kV Circuit Breaker Standard Control Diagram
211379	138 kV Circuit Breaker Standard Control Diagram
211791	Installation of Emergency Diesel Generator for Temporary Usage
213741	Typical Diesel Generator Foundation



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DRAWING NUMBER	TITLE
214215	Procedure For Purchasing And Fabricating Nameplates For Protective Relays, Multi-Contact Relays And Timer Relays
218484	General Notes, Symbols and Mounting Details for Interior and Exterior Lighting Yard Operating Areas
218485	Mounting Details for Interior and Exterior Lighting, Office Control Room and Yard Area
218486	Typical Underground Conduit And Pipe Details And Direct Buried Cable
218491	Assembly Of Standard 138 kV And 345 kV Single Pothead Structure-Plan And Sections
218492	Assembly and Details of Dielectric Fluid Piping for 138 and 345 kV Feeder Pipes
218495	Standard Above Grade Conduit Connections For Electrical Equipment
218501	Installation Details For Equipment Signs For Area Substations
221319	Loading Tabulation of Miscellaneous Electrical Equipment Supports
221320	Standard Details of Foundation for Miscellaneous Electrical Equipment Supports
221323	Standard Foundation for 65 MVA Area Substation Transformer
B221335	Standard Structural Support For 138 kV Single Pothead-Plan, Elevation And Sections
B221336	Standard Structural Support For 138 kV Single Pothead-Sections
221341	Standard Details for Connection of New Electric Trench to Existing Electric Trench
221345	Standard Indoor Cable Trench for Switchgear House – Plant and Sections
A233088	Standard Structural Support For 138 kV 3 Phase Bus Support
233090	Standard Disconnect Switch Stand For 138 kV Bus
233091	Standard Structural Support For 345 kV Single Pothead-Plan, Elevation And Sections
233092	Standard Structural Support For 345 kV Single Pothead-Sections
233093	Standard Structural Support For 345 kV 3 Phase High And Low Bus Support
233094	Standard Structural Support For 138 kV And 345 kV High And Low Bus Single Phase Bus Supports, Surge Arresters, CCPD And Potential Transformers
233095	Standard Support for 345 kV Three Phase CCPD
233096	Standard Combined Support For 345 kV 3 Phase Bus And Disconnect Switch Structure
233097	Standard Combined Support For 345 kV CCPD And Wave Trap Structure
233098	Standard Support For 345 kV CCPD
233099	Standard Supports For 345 kV Bus – Aluminum
233100	Standard Support For 345 kV Disconnect Switch
233101	Standard Combined Support For 345 kV Bus



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# ALL STATION REFERENCE DRAWINGS

	DRAWING NUMBER	TITLE	
- 10 E	233102	Standard Combined Support For 345 kV CCPD And Wave Trap - Aluminum	
	233103	Standard Support For 345 kV Single Phase Bus And CCPD	
	233671	Standard Structural Support For 138 kV Pothead And Ground Switch-Plan, Elevations And Sections	
	233672	Standard Structural Support For 138 kV Pothead And Ground Switch-Plan, Elevations And Sections	
	233830	Various Substations – Typical Mounting Details for Installation of Capacitor Banks	
-	A238112	Numbering System For 138/27/13 kV Area Substations	
F	239612	Foundation Details for Electrical Equipment Supports	
F	240623	Capacitor Bank Foundations and Fence	
F	242434	Fire Protection System Remote Manual Station For Deluge Valves	
F	243543	Telephone Test Switch Device Arrangement	
	244496	Schematic Wiring Diagram 125V DC Load Board 2	
s en la ser F	247486	List Of Alarms For Station Annunciator	
. 6	247487	Schematic Diagram Of Alarm Circuits Points 1 To 20	
-	247488	Schematic Diagram Of Alarm Circuits Points 21 To 40	
	247489	Schematic Diagram Of Alarm Circuits Points 41 To 60	
ſ	247490	Terminal Block Arrangement & Designations For Station Alarm Pane	
ſ	247491	Schematic Wining Diagram 208 Volt AC Supply Load Board 1	
Γ	247492	Schematic Wiring Diagram 208 Volt AC Supply Load Board 2	
	247493	Schematic Wiring Diagram For 120/208 Volt AC Miscellaneous Panel	
	247495	Schematic Wiring Diagram 125V Volt DC Load Board 2	
	247498	Schematic Wiring Diagram -208 Volt AC Load Shedding & Re-Energizing Connections	
	247499	Diagram Of Internal Connections-208 V Load Shedding Panel	
	247500	Schematic Wiring Diagram -Station Shutdown & Re-Energizing Control Network A	
	247501	Schematic Wiring Diagram -Station Shutdown & Re-Energizing Control Network B	
	247502	Diagram Of Internal Connections For Station Shutdown & Re-Energizing Control Panel	
	247504	Voltage Reduction Panel Schematic Wining Diagram For 5 Bank Area Substation	
ļ	247505	Diagram Of Internal Connections-Voltage Reduction Panel	
	247506	Schematic Wiring Diagram – V/R Panel - Transformers 1-10	
[	247511	Schematic Wiring Diagram - DC Control For Back Up Panel	



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#### ALL STATION REFERENCE DRAWINGS

DRAWING NUMBER	TITLE	
247512	3 Line AC Schematic For Transformer Backup Panel	
247513	Wiring Diagram of Backup Panel	
247514	Wiring Diagram of Backup Panel	
247520	Simplified Schematic-13 kV Area S/S-Sects 1 & 2	
247521	Simplified Schematic-13 kV Area S/S-Sects 3 & 4	
247522	Simplified Schematic-13 kV Area S/S- Sect 5 & Syn Buses	
247523	Simplified Schematic-27 kV Area S/S-Sects 1 & 2	
247524	Simplified Schematic-27 kV Area S/S-Sects 3 & 4	
247525	Simplified Schematic-27 kV Area S/S-Sect 5 & Syn Buses	
247531	Switchgear Cable Block Diagram	
247616	Load Shedding Panel Arrangement & Construction	
247617	Start Up/Shut Down Panel Arrangement & Construction	
247618	Remote/Manual Transformer Voltage Reduction Panel Arrangement & Construction	
247619	Station Alarm Panel-Assembly & Detail	
247620	120/208 Volt Load Boards 1 & 2-Construction	
247621	125 Volt DC Load Boards 1 & 2-Panel Arrangement	
247622	One Line Diagram-120/208 Volt L & P	
247624	Typical Entrances/Crossovers For Conduits	
247626	One Line Diagram-13/138 kV Connections	
247627	One Line Diagram-27/138 kV Connections	
247628	Typical Conduit Duct Bank	
247633	Termination PVC, Entering Side Of Trench	
250241	5 Bank Area S/S Switchgear Arrangement	
250242	Control Room Arrangement	
250244	Structural Detail Outdoor Back Up Panel	
251974	Standard Structural Support For 138 kV Double Pothead	
251975	Standard Structural Support For 138 kV Double Pothead Stand	
252001	Standard Pipe Supports And Hangers For Fire Protection	
253603	All Station Underground Standard	
253761	13 kV Cap Bank Schematic	
253762	27 kV Cap Bank Schematic	
301953	Permanent Freeze Pit for 138 and 345 kV High Pressure Cable Pipe	
303000	Distribution of Ground Fault Current From Ground Connections To Ground Grid	
303001	Typical Substation Grounding Plan	
303002	Methods Of Grounding Substation Fence	



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DRAWING NUMBER	TITLE	
303003	Method Of Grounding Surge Arresters	
303004	Method Of Grounding Cable Sheaths	
303006	Physical Arrangement Of Fence And Parallel Transmission Lines	
303007	Calculation Of Equivalent Separation Of Non-Parallel Lines To Fence	
303008	The Magnetic Field Around A Bus Carrying Current	
303009	Electrostatic Field Due To The Current	
303010	Equivalent Circuit Of A Control Cable Exposed To The Electric And Magnetic Field Of The Bus Current	
303011	Moisture Absorption By Concrete Cubes Embedded In Soil	
303012	Typical Ground Connection For Building Column	
303013	One Line Diagram Transmission Substation Light And Power Supply System (Typical)	
303014	One Line Diagram Area Substation Light And Power Supply System (Typical)	
303015	Substation Interlock Scheme for 13/27/33 kV Bus Section	
303016	Substation Interlock Scheme for Station Syn Bus	
303017	Substation Communication Model Layout (Typical)	
303018	Plan View Of Substation Communication Facilities Equipment (Typical)	
303019	Protection Of Telephone Facilities Entering Substations (Typical)	
303020	Section View Of Transformer Moat Overflow Drain Pit	
303021	View Of Oil Water Separator Within Retention Pit	
303022	Section View Of Collecting Pit With Oil Trap For Transformer Secondary Containment	
303023	View Of Oil Trap Separator For Station Drainage	
303024	Typical Moat Configuration For Substation	
303025	Moat With Geo-Synthetic Liner For Substation	
303026	Moat With Concrete Floor (Typical)	
303027	Substation Communication Connection Arrangement And Maintenance Responsibilities	
303028	Secondary Containment Facility For New Power Transformer Installation	
303029	Secondary Containment For Substation Drainage Systems	
303030	Sump Pit With Alarm For Secondary Containment Facility	



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DRAWING NUMBER	TITLE	
303031	Various – Substation Control And Instrumentation Architecture	
303032	Typical One Line Diagram Of Breaker-And-A-Half Design	
303033	Typical One Line Diagram Of Ring Bus Design	
303034	One Line Diagram For Area Substation Double Syn Bus Design	
303035	Typical 138 kV Ring Bus Circuit Spacings	
303036	Typical 345 kV Ring Bus Circuit Spacings	
303037	Typical 345 kV Breaker-And-A-Half Circuit Spacings	
303038	Typical Design For Removable Railing For Pothead Platforms	
303042	One Line Diagram Of 138 kV And 345 kV Breaker-And-A-Half High Tension Connections – Detailed	
303043	043 One Line Diagram Of 138 kV And 345 kV Double Ring Bus High Tension Connections- Detailed	
303046	Recommended Connection for Leased for Telephone Cables	
303048	Transmission Substation Potential Source Connections	
303051 Typical Conduit Installation of Conduits Entering Through Side of Trench		
303053	303053 Typical Conduit Installation of Pocket Type Switchgear Floor Design	
303054	Typical Conduit Installation for Terminating Conduit in Switchgear	
303055	Typical Electrical Clearance of Concrete Encased Conduit Bank from 138 and 345 kV Feeder Pipes	
303056	Typical Conduit Bank Installation for Encasing Conduits on Concrete	
303057	Typical Conduit Installation of Conduits Entering Through Bottom of Cable Trench	
303058	Typical Conduit Installation for Direct Buried Cable	
303059	3059 Typical Conduit Installation for Conduits Terminating in Precast Trench	
303060 Cable Entry into Equipment Cubicle		
303061	Control Cable Terminations	
303062	Termination of Shielded Instrument Cables	
303063	Typical Method for Patching Openings in Relay Panels – Method 1	
303064	Typical Method for Patching Openings in Relay Panels – Method 2	
303065	Typical Method for Patching Openings in Relay Panels – Method 3	
303066 Typical 138 and 345 kV Circuit Breaker Control Schematic		
306356	Typical Arrangement of Piping for Permanent Installation of Dielectric Fluid Flow Meters for Pressurizing Plants	
306357	306357 Typical Arrangement of Piping for Permanent Installation of Dielectric Fluid Flow Meters for Pressurizing Plants	
307528	Chain Link Fence of Hazardous Waste Storage Area	
314570	One Line Diagram of Substation Computer Based Annunciator System	
314926	One Line Diagram of PLC Computer Based Annunciator System	
328488	Panel Arrangement for Load Management System	



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DRAWING	
NUMBER	TITLE
328958	Schematic Diagram of 208 Volt AC Network A Load Shedding Circuit
328959	Schematic Diagram of 208 Volt AC Network B Load Shedding Circuit
328960	Diagram of internal Connections of the Load Management Cabinet
330259	Flexi test Switch Open Network Start Up/Shut Down System and Load Management System Trouble Alarm
332939	Schematic Diagram of Operating Procedures for 13 kV Capacitor Bank C1
332940	Schematic Diagram of Operating Procedures for 13 kV Capacitor Bank C2
332941	Schematic Diagram of Operating Procedures for 13 kV Capacitor Bank C3
340121	General Arrangement of 138/13 kV Control Equipment, Mezzanine and Second Floor-Plan
340122	General Arrangement of 138/13 kV Control Equipment, Mezzanine and Second Floor-Sections
340123	General Arrangement of 138/13 kV and Control Equipment - Street Access
340126	General Arrangement of 138/13 kV and Control Equipment - Sections
340139	One Line Diagram Of 138 or 345 kV Single Ring Transmission Substation High Tension Connections
340328 ·	Grounding 1 <sup>st</sup> Floor Plan
340329	Installation Of Isolators/Surge Protectors For Feeder Cathodic Protection
340338	Grounding Details
340345	Installation Of Shielding Plates For 13 kV Distribution Manholes
340404	Installation Of Cathodic Protection For 138 kV Feeders
340958	Transmission Control Room Layout
340982	One Line Diagram 120/208 Volt AC Supply Load Boards 1 And 2 For Breaker And A Half Transmission Substation
341034	One Line Diagram 13 kV/120/208 Volt Ac Supply Load Boards 1 And 2
341071	One Line Schematic Wiring Diagram For 125 Volt Dc Load Boards 1 And 2 And Misc Cubicle For Transformer 1 – 5 Bank Area Substation
341703	Arrangement And Outline Of 125 Volt Dc Load Board 1
341244	One Line Of 125 Volt Dc Load Boards 1 And 2
341255	General Arrangement Of Type "B" Signs For Relay Panels
341256	General Arrangement Of Type "C" Signs For Relay Panels
341257	General Arrangement Of Type "A" Signs For Relay Panels
341258	General Arrangement Of Type "D" Signs For Relay Panels
341259	Standard Drawing Format For Ordering Signs On Station Electrical Material List
341365	List Of Alarms For Station Annunciator 5 Bank Area Substation
343310	Schematic Diagram Of Operating Procedure For 13 kV Capacitor Bank C4
344638	Standard Cable Block Diagram 27 kV 5 Bank Area Substation Sheet 1 Of 5

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#### ALL STATION REFERENCE DRAWINGS

DRAWING NUMBER	TITLE
344639	Standard Cable Block Diagram 27 KV 5 Bank Area Substation Sheet 2 Of 5
344640	Standard Cable Block Diagram 27 KV 5 Bank Area Substation Sheet 3 Of 5
344641	Standard Cable Block Diagram 27 KV 5 Bank Area Substation Sheet 4 Of 5
344642	Standard Cable Block Diagram 27 KV 5 Bank Area Substation Sheet 5 Of 5
344643	Standard Cable Block Diagram 13 kV 5 Bank Area Substation Sheet 1 Of 5
344644	Standard Cable Block Diagram 13 KV 5 Bank Area Substation Sheet 2 Of 5
344645	Standard Cable Block Diagram 13 KV 5 Bank Area Substation Sheet 3 Of 5
344646	Standard Cable Block Diagram 13 KV 5 Bank Area Substation Sheet 4 Of 5
344647	Standard Cable Block Diagram 13 KV 5 Bank Area Substation Sheet 5 Of 5
344848	Operating Procedure For Key Interlock System Of High Voltage Test Set Equipment
344649	Lock And Key Schedule For Key Interlock System Of High Voltage Test Set Equipment
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8.0 ENVIRONMENTAL CONSIDERATIONS A state of the second se

- Electromagnetic Fields (EMF) 8.1
  - 8.1.1 Design methods to mitigate the effects of electromagnetic fields due to the operation of electrical equipment located within the substation or PURS Facility and the possible exposure of the public to those fields should be considered for additions or modifications to an existing substation or PURS Facility.

1.4

- 8.1.2 The following design methods should be considered in order to mitigate EMF exposure by station personnel as well as the public:
  - а. Distance - The design should arrange new equipment such that potential sources of EMF (high current carrying components like bus, cable, capacitor banks, etc.) are located at a specified distance from the fenced property line, thereby resulting in negligible EMF levels at the property line.
  - Configuration Reconfigure or reorient components within the station. b. Utilize triangulation and phase transposition of bus and cable to mitigate EMF through cancellation effects. Reorient EMF sources making them perpendicular (rather than parallel) to public areas, thereby, achieving minimum field intensities in these areas due to the vectorial displacement of the magnetic field with respect to the conductor. Run equipment connecting bus and cable in a three-phase configuration rather than single phase.

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- c. Shielding The design should consider grounded metallic shields or mesh for equipment and distribution feeder outlets. Although this method will yield reduced EMF levels, it may adversely impact other related station design concerns (HVAC, operational aspects, interlock scheme). Therefore, this approach could be more costly and less efficient in mitigating electromagnetic field effects.
- 8.2 Environmental Excellence
  - 8.2.1 The EH&S design of the substation or PURS Facility shall follow all applicable federal, state and local laws and regulations, Company procedures and specifications and Part 13 of this Design Guideline. The purpose is to provide the required environmental design guidelines to insure environmentally sound and responsible design for all area and transmission substation or PURS Facility installations.
  - 8.2.2 **CE-ES-2002,** Part 13 shall be utilized as a guideline to avoid and/or mitigate pollution and/or reduce waste as feasibly and practically possible within the boundaries of the engineering design.
  - 8.2.3 The EH&S design must incorporate the principles of pollution prevention into the design of new facility. Pollution prevention seeks to eliminate the release of all pollutants (hazardous and non-hazardous) to all media (land, air and water). In addition, pollution prevention also includes water conservation and protection of natural resources.
    - 8.2.4 Each substation will be designed with the following environmental, health and safety areas:
      - a. Hazardous Waste Storage Area
      - b. Asbestos Waste Storage Area
      - c. Solid Waste Storage Area
  - 8.2.5 Details on the EH&S design of these storage areas are contained in Specification CE-ES-2002, Section III, Part 13, latest revision, of this design guideline.
  - 8.2.6 The installation of all underground and above ground storage tanks shall be equipped with the appropriate leak monitoring and detection systems, corrosion systems, corrosion protection, spill and overflow protection equipment, secondary containment facilities, etc. in accordance with applicable Federal, State and Laws and regulations.
  - 8.2.7 The design of a new facility or any modification, involving the use, handling, installation, storage, removal, encapsulation, enclosure, transport, or disposal of Asbestos Containing Material should be performed under the guideline of the Asbestos Management Manual.
  - 8.2.8 All new installations shall utilize non-PCB filled (O-PPM) equipment such as transformers, reactors, capacitors, etc., in accordance with the latest Con Edison environmental, health and safety procedures and associated specifications.

#### CE-ES-2002, SECTION I, GENERAL REQUIREMENTS

#### NOVEMBER, 2005

- 8.2.9 The design shall include methods and procedures to safely remove and properly dispose of any hazardous substances and wastes that affect this design in accordance with Con Edison's environmental, health and safety procedures.
- 8.2.10 The design shall provide the required containment and/or diversion facilities for those materials listed or characterized as hazardous substances that can not practically and economically be disposed of, in accordance with this specification.
- 8.2.11 The design should acknowledge and include (if applicable) the required permits needed for temporary storage, transport and disposal of any hazardous waste created by or generated by this design, unless the activity and/or the substation is conditionally exempt or unless otherwise directed by the Facility Manager.
- 8.2.12 Noise levels for all installed equipment will be within the property line noise abatement rules for the area where the station is built.

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#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request	No.:	DPS-9

Requested By:

Hebert Joseph, (518) 486-2460

Date of Request:

December 12, 2005

**Reply Date:** 

Witness: Subject:

Engineering Specifications

Provide a copy of the specifications and catalog cut sheets for the following equipment to be installed at Cedar Street:

- Transformer
- Circuit switcher
- Circuit interrupter
- Potheads
- Switchgear

## Response to DPS-9:

- Transformer
- Circuit switcher
- Circuit interrupter

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- Potheads
- Switchgear

- See Attachment DPS 9-1
- See Attachment DPS 9-2 & DPS 9-3
- See Attachment DPS 9-2 & DPS 9-3
  - See Attachment DPS 9-4
  - See Attachment DPS 9-5

Attachment DPS 9-1

# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-27, REV. 1

#### PART II

# DETAIL SPECIFICATION FOR 58.3/65 MVA, 132-13.8 kV, 55/65 Degrees C AREA STATION TRANSFORMER

#### LOCATION

1.0 This specification and General Purchase Specification EI-4161, latest revision, details the requirements for furnishing area station transformers that will be shipped to and used at numerous locations on the Consolidated Edison Co.'s Electrical system

# **DESIGN REQUIREMENTS**

## GENERAL

- 4.1 The nominal operating system voltage is 138 kV. The 138 kV transmission system is wye-connected with a solidly grounded neutral. The maximum continuous system voltage is 145 kV.
- 4.2 The low voltage winding will be connected via phase-segregated bus and metalclad switchgear to a 13.8 kV three-phase wye, grounded neutral, underground cable network system.
- 4.3 The transformer rating shall be as follows:

4.3.1 The transformer shall be three-phase, 60 hertz, with a delta connected high voltage primary winding with a nominal rating of 132 kV. The low voltage secondary winding is to be wye-connected and grounded through a neutral reactor.

4.3.2 The transformer is to have a rating of 35/46.7/58.3 MVA at 55 degrees C winding temperature rise and 39.2/52.3/65.33 MVA at 65 degrees C winding temperature rise.

4.3.3 The transformer rating shall be as stated regardless of the de-energized and load tap changer positions. Therefore, the manufacturer must size the load tap changer and high voltage primary winding accordingly.

4.4 The transformer impedance on the 35 MVA base for 55 degrees C shall be 14 percent, nominal on the neutral tap position. The transformer shall also be designed to provide an impedance change over the full tap changer range as shown in Attachment No. 4.

# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

4.5 The transformer shall have a neutral air-core reactor with a 1.0 ohm impedance, 300A continuous rating, 5000A, 10 second rating, minimum, and insulated for 110 kV BIL.

7.0 Insulation Level

•	High Voltage Windings:	'550111 mm
	High Voltage Bushinger	220 KA BIL
	Law M have Businnes:	650 kV ВП.
	Low Voltage Windings and Bushings	110 ky DH
	Neutral Terminal and Buchings	TIOKABIL
	and Dusning:	110 kV BIL

# 22.0 Current Transformers

 High Voltage Bushings: Low Voltage Bushings
Two (2) current transformers, ratio 600/5 A per bushing One (1) current transformer, ratio 2300/0.2 A on the X1 bushing for operation of the load tap changing
Neutral Bushing:

Two (2) current transformers, ratio 2000/5 A

25.0 De-Energized Tap Changer

A de-energized tap changer shall be provided on the high voltage winding with two (2) +/-  $2\frac{1}{2}$  percent steps when the neutral positions 132 kV.

29.0 Load Tap Changing Equipment

Required with a range of +/- 12 percent in 33 steps.

# TANK CONSTRUCTION

88.1 These transformers will be designed for interchangeability on the Con Edison system. Therefore, the manufacturer shall design the transformer in accordance with the dimensional constraints and general arrangement drawing, Attachment 1.

88.2 Low voltage bushing arrangement and flange requirements are shown in Attachment No. 3

# MISCELLANEOUS

141.0 Surge Arresters

Brackets and shelf shall be provided for mounting surge arresters on the transformer tan cover.

# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

# 142.0 Bushing Potential Devices (BPDs)

Required with mounting bracket and wiring on both sides of the tank. These provisions shall include the secondary wiring and conduit required between the devices and the main control cabinet.

# SOUND ENCLOSURE REQUIREMENTS

145.0 The following transformer sound level design options are required.

145.1 Base

Transformers are to have a maximum 60 db(A) sound level limitation in accordance with NEMA Publication TR1, part 9. The maximum sound level shall be at the 65 degrees C rating of the transformer (65.3 MVA).

# 145.2 Option 1

Transformers are to have the following maximum average sound level limitation in accordance with New York City M1-R noise performance requirements at the transformer vault louvered face of the substation. The maximum sound level shall be at the maximum 65 degrees C rating of the transformer (65.3 MVA)

Octave Band Frequency	
(Hz)	Maximum Average Sound Level
(===)	· (db)
120	
240	68
. 360	60
480	53
	53

#### 145.3 Option 2

145.3.1 Transformers are to have a maximum 60 db(A) sound level limitation in accordance with NEMA Publication TR1, Part 9. The required cooling is to be performed by self-cooling or forced-oil circulation. Cooling fans on the radiators or FO coolers are not permitted. The transformer's noise level must be minimized. The maximum sound level shall be at the maximum 65 degrees C rating of the transformer (65.3 MVA).

145.3.2 The transformer's main tank is to be installed in a totally enclosed vault with the radiator banks installed in an open top three-sided vault facing the street. A sound wall will be installed between the main tank and radiator banks. The design of the transformer shall be in accordance with the dimensional constraints as shown in Attachment 1.

# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

Attachment 2 shows the typical arrangement for the installation of a sound barrier between the main tank and radiator banks.

145.3.3 The radiator banks shall be sized to dissipate the total losses of the transformer. The transformer main tank vault will be ventilated with low noise fans, supplied by Con Edison. The main tank vault temperature will be maintained to a maximum temperature of 125 degrees F (52 degrees C).

146.0 No free standing or tank supported sound enclosure permitted under Option 1 and 2, as detailed above. Double tank wall is permitted.

# LONG-TERM STORAGE

172.0 Required

# SHIPPING INSTRUCTIONS

187.0 Shipping Limitations

The transportation dimensional and shipping constraints are detailed in Attachment 5.

# EXTENDED WARRANTY

203.0 Transformer shall have a warranty for 36 months from date of energization or 48 months from date of acceptance by Company.

# EVALUATION OF PROPOSALS

207.0 Loss Evaluation

-Carrying-Charge:	16 percent
No-load Losses:	\$657 per kW-year
Load Losses:	\$163 per KW-year
Auxiliary Cooling Equipment Losses:	\$163 per KW-year

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Donald Chu Technical Specialist

# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

#### Attachments

- No. 1 General Transformer Outline and Arrangement Drawing No. 2
- Transformer General Arrangement Drawing for Enclosed Vault No. 3
- Low Voltage Bushing Arrangement and Flange Details No. 4
- Allowable Impedance Range No. 5
- Shipping Limitations

Company Drawings (General Specification EI-4161)

A239621 - Terminal Block Arrangement for 345/138 kV Transformer

\_X\_\_\_A239576 – Terminal Block Arrangement for 138/13 kV and 138/27 kV Transformer

X\_\_\_ B190950 – All Stations Relay Board Nameplates

\_\_\_\_X\_\_\_ B167934 – Schematic Diagrams of Typical Tap Changer Controls

\_X\_\_ B167935 – Schematic Wiring for Oil Insulated Transformer Cooling Equipment

\_X\_\_ B239506 – Transformer Paralleling Standard

\_\_ C239482 – List of Alarms for Transformer Annunciator  $\mathbf{X}$ 

# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

# ATTACHMENT NO. 3

# Low Voltage Bushing Arrangement and Flange Details


# SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

# ATTACHMENT NO. 4

## Allowable Impedance Range



NOTES:

- (1) The ploted impedance range is based on a load of 35 MVA at the tap voltage value and the percent impedance is based on the voltage of the tap.
- (2) The transformer to be furnished shall have an impedance characteristics which does not deviate from the impedance zone based on the conditions that the 13.8 kV winding output is 35 MVA at the tap voltage. No impedance tolerance is allowed outside of the impedance range specified.

#### SUBSTATION ENGINEERING DEPARTMENT EQUIPMENT & FIELD ENGINEERING SECTION SPECIFICATION EI-4161-24, REV. 1

### ATTACHMENT NO. 5

#### Shipping Limitations

#### Main Tank -

- 1. Height shall not exceed 150 inches
- 2. Width shall not exceed 128 inches
- 3. Overall length shall not exceed 350 inches, including all valves, cabinets and other appurtenances protruding off of the end of the tank, below a dimension of 58 inches above the base of the main tank.
- 4. Weight shall not exceed 165,000 lbs.

#### Accessories

Banks of radiators or coolers, including all required accessories can be designed for transport in a vertical or horizontal position, within a profile not to exceed a length of 300 inches, width of 130 inches and height of 144 inches.

#### **Routing and Conditions of Delivery**

- 1. Main tank shall be routed to a marine heavy-lift berth at Port Newark, New Jersey, domestically via CSX or off-shore via ocean vessel. Pricing option shall be provide for derrick-lighterage move to Con Edison dock facilities, Heligate dock in Bronx, NY or Astoria Lyster Creek dock in Astoria, NY.
- 2. Radiator bank(s), conservator tank(s), long-term storage containers and all other accessories will be delivered via motor truck FOB to the respective Con Edison site.
- 3. Acceptance of delivery will be predicated upon the results of our inspection(s) of the equipment at the respective FOB destination.
- 4. Alternatives to any of the above routing and conditions of delivery may be proposed only as "Options".

ELECTRICAL ENGINEERING DEPARTMENT ELECTRICAL SUBSTATION AND TRANSMISSION ENGINEERING SECTION SPECIFICATION NO. EI-4161, REV. 3 JANUARY, 1993

# PART I

# GENERAL PURCHASE SPECIFICATION FOR LARGE POWER AND PHASE ANGLE REGULATING TRANSFORMERS AND SHUNT REACTORS

## SCOPE

1. This general specification together with the Detail Specification Part II covers the technical requirements for oil-filled power transformers, phase angle regulating (phase shifting) transformers and shunt reactors for installation at various locations of the Consolidated Edison Company of New York, Inc., herein referred to as the Company.

# **STANDARDS**

2. The item "Standards" whenever used in this specification, refers to the latest applicable Standards published by the American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE) and National Electric Manufacturers Association (NEMA). Except as otherwise specified or as modified in this specification, all apparatus furnished herein shall conform to all applicable requirements of the aforementioned Standards, in particular ANSI C-57 series, whether or not specifically mentioned, and the administrative Code of the City of New York.

## SERVICE CONDITIONS

3. The equipment shall be suitable for the following service conditions, unless otherwise indicated in Detail Specification - Part II.

- Outdoor, sheltered louvred vault installation
- Ambient air temperature range from minus 30 degrees C to plus 40 degrees C (minus 22 degrees F to plus 104 degrees F).
- Exposure to solar radiation.
- Located at essentially sea level.

## **DESIGN REQUIREMENTS**

EI-4161, REV. 3 JANUARY, 1993

# GENERAL

4. The transformers shall be outdoor type, oil immersed. The ratings and winding connections shall be as indicated in the Detail Specification - Part II.

# **VOLTAGE LIMITS**

5. The equipment shall be capable of:

Nominal	Voltag	e Limits	Duration		
System Voltage (kV)	Range (kV)	Minimum (kV)	(Minutes)		
	Over 160	-	0		
	153-160	-	10		
138	146-152	124	30		
	130-145	··· 130	Continuous		
	Over 266	All and the	· 0		
	255-266	· " _	10		
230	243-254	206	30		
	217-242	217	Continuous		
	Over 400	-	. 0		
	381-400	· _	10		
345	363-380	311	30		
	328-362	328	Continuous		
	Over 600	-	0		
	576-600	-	10		
500	551-575	445	30		
	475-550	475	Continuous		

## **INSULATION LEVELS**

6. The equipment shall have the following:

Winding Insulation Class (kV)	Winding BIL (Fully Insulated) (kV)	Winding dc Test Voltage (kV)	•	Minimum Bushing BIL (kV)
5	75	19		75
8.7	95	26		95
15	110	34		110
25	150	50		150

EQUIPMENT STANDARDS			EI-4161, REV. 3 JANUARY, 1993
27	200.	70	200
34.5	200	70	200
46	250	95	250
69	350	140	350
138	550	230	650
345	1050	460	1175

Note: The aforementioned basic impulse insulation level (BIL) levels do not not apply to windings with graded insulation or wye-connected windings.

7. The basic impulse insulation level (BIL) rating of graded insulated windings shall be at least the same as that of the neutral bushing. The minimum insulation class shall be 15 kV, 110 kV BIL.

8. Transformers, phase angle regulators and shunt reactors shall be designed to withstand the routine dc proof test voltages specified above for five minutes. The unit is to be tested in the factory and the Company will apply the appropriate dc test voltage on each winding-to-ground for five minutes.

#### SHUNT REACTOR

9. The shunt reactor shall have a saturation curve representing the characteristic magnetization of the core with the following minimum design requirements:

- Linear to 110 percent of the rated voltage
- Knee of curve at 120 percent of the rated voltage with a tolerance between 115 percent and 125 percent

#### SHORT CIRCUIT CAPABILITY

10. The transformers and phase angle regulators furnished to this specification shall be designed and constructed as to be capable of withstanding without damage the techanical and thermal stresses caused by normal short circuit duty imposed on the exterior terminals of the windings. The equipment shall be capable of sustaining terminal faults limited only by its own leakage impedance on the minimum impedance tap without damage.

11. Conformance to short circuit thermal requirements shall be by calculation in accordance with ANSI C57.12.90, latest revision.

12. Conformance to short circuit mechanical requirement shall be by submission of certified test data showing that the proposed design successfully passed the test specified in ANSI standards.

# ELECTRICAL CLEARANCES

13. The minimum phase-to-phase and phase-to-ground clearances (strike distances) of the bushings to metallic surfaces in air shall be as follows:

Minimum Phase-to-Phase Strike_Distance	Minimum Phase-to-Ground Strike_Distance
7 inches	6 inches
12 inches	7 inches
18 inches	13 inches
18 inches	13 inches
30 inches	25 inches
72 inches	60 inches
132 inches	108 inches
	Minimum Phase-to-Phase Strike_Distance 7 inches 12 inches 18 inches 18 inches 30 inches 72 inches 132 inches

# LOADING CAPABILITY

14. The transformer and all accessories shall be designed to meet or exceed the following Company requirements for emergency loading:

Percent of Top Forced	65 Degrees C Cooled Rated	Hours Overload per 24 hour Period	Maximum Percent Acceptable Loss-of-
Load	(%)		Life
30 Degrees C	5 Degrees C	Assuming 100	
Ambient (Summer)	Ambient (Winter)	percent Prior Load	Per 24 hour period
120	140	24	0.25
127	147	24	0.50
143	161	3	1.0
169	191	1	1.0
180	200	0.33	1.0

## SYSTEM CONDITIONS

EI-4161, REV. 3 JANUARY, 1993

15. The transformer shall be capable of operating continuously with 15 ampere of dc current flowing from the high voltage to low voltage windings or visa versa in an autotransformer or from the high voltage or low voltage winding to ground through the neutral connection for wye connected winding configuration. Operation of the transformer shall not be limited by factors such as stray flux, sound level, core saturation, etc.

# DETAIL REQUIREMENTS

#### GENERAL

16. No bare metallic current carrying parts in the transformer's tank is permitted. All busses, leads, connectors, conductors and associated details shall be taped and insulated using paper tape and/or tube to withstand rated voltage, including the neutral bus and leads.

17. All busses and cabling leads shall be supported off of support structures. Tieing of cable leads with linen tape to support structures is not acceptable.

18. No PVC, PCB, asbestos or lead material shall be used.

## BUSHINGS

19. All bushings shall be of "extra creepage" design and ANSI Standard outdoor type. Bushings shall be chocolate brown, unless otherwise specified in Detail Specification - Part II.

20. The following bushings shall be used:

System	BIL	Current	ABB Style	Vert or
Voltage (kV)	(kV)	(A)	Number	Horiz
500	1550	1600	550X1600UF	Vert
345	1175	2000	362X2000UJ	Vert
138	650	800	138X0800AA	Vert <sup>·</sup>
		2000	138X2530AD	Vert
69	350	400/1200	069X0412AN	Vert
27	200	2000	034X2000BA	Vert
		2000	034U0200HB	Horiz
18.8/22	200	10000	034T1000HN	Both
13.8	110	3000	025X3000BF	Vert
		3000	025U0300HS	Horiz

		4000	025X4000UB	Vert
		4500	025U0450HP	Horiz
Neutral	110	400/1200	025X0412AT	Vert

21. Alternative bushing manufacturers will be considered only if all electrical characteristics and dimensional aspects are compatible. The bushing manufacturer, type and catalog number shall be submitted for approval.

22. All bushings for 138 kV or higher voltage windings shall be equipped with Type A normally grounded capacitance potential tap. The unit shall be suitable for possible future use with either a General Electric KA-108 or Westinghouse PBA-2 bushing potential device. On all other bushings, a test tap will be accepted if capacitance taps are not available.

23. All bushings shall be one piece porcelain or multi-piece joined by epoxy or glass welded. Gasketed joints are not acceptable.

24. All winding neutral connections shall be brought out through outdoor type bushings. The neutral bushing for the main windings shall be the same type and rating as the phase bushings, minimum 15 kV, 110 kV BIL.

24.1 The neutral bushing(s) shall be grounded to a 1/4 by 4-inch ground bus copper detail through a removable flexible connector. The copper bus detail shall be run and attached to one of the two ground pads on the base of the unit. A removable protective cover shall be furnished over the neutral bushing(s).

#### **CURRENT TRANSFORMERS**

25. The quantity, location and ratio of current transformer requirements shall be as indicated in in the Detail Specification - Part II.

26. The current transformers shall be manufactured and tested in accordance with ANSI C57.13.

27. Bushing type, multi-ratio, current transformers shall be provided and arranged so as to be accessible and removable from outside the transformer tank through top cover manholes. All secondary leads shall be brought out through a terminal board located on top of transformer tank. The current transformers shall not be internally grounded.

28. All current transformers shall be located on the top section of the core and coil assembly. Access to current transformers shall be such that Company personnel can perform polarity and ratio tests through the manholes without internal tank entry.

29. For each design of current transformer, the manufacturer shall submit to the Company for approval two certified copies of calculated (or typical) ratio correction curves and excitation curves. All of this information shall be furnished for each tap of the multi-ratio units.

29.1 Multi-ratio current transformer shall have a thermal rating factor of 1.5 and conform to the latest ANSI Standard C57.13, unless otherwise specified.

29.2 Accuracy class for relaying at standard burdens shall

CT Ratio

ANSI Accuracy Class

2000/5 (and higher)				C800
1200/5				C400
800/5				C200
600/5	. ·			C200
400/5				C100

29.3 The following standard tests shall be performed on the current transformers and certified test reports submitted to the Company for evaluation.

- Low frequency dielectric tests between windings and ground
- Induced potential tests
- Accuracy tests
- Polarity test
- Excitation current curve to 100 volts

# DE-ENERGIZED TAP CHANGING EQUIPMENT

30. When this equipment is specified in the Detail Specification - Part II, it shall conform to the requirements specified below.

31. A de-energized tap changer shall be provided in the specified winding to give two 2.5 percent full capacity taps above and below the rated voltage.

32. The tap changer shall be externally operated and arranged for padlocking in each tap position.

33. The tap changer operating mechanism shall be mounted approximately 2 feet from the top cover of the transformer. The operating mechanism shall also be covered with a removable metal enclosure. The contacts shall be fully and easily accessible through manholes in the transformer top cover without untanking.

## LOAD TAP CHANGING EQUIPMENT

34. When this equipment is specified in the Detail Specification - Part II, it shall conform to the requirements specified below. A tap changer manufactured by MagneTek Electric or Reinhausen is required.

35. The tap changing equipment will have a range of 12 percent buck to 12 percent boost in 32 steps (33 steps total) at the nominal rated voltage. Tap changer positions shall be labelled 16R to Neutral to 16L.

36. The transformer and tap changer shall be capable of operating continuously without overheating at maximum continuous system voltage with the no-load and load tap changer at minimum voltage tap position.

37. The low voltage winding(s) shall be capable of continuous operation at constant current. The current is the maximum current capability of the winding, regardless of the de-energized and automatic tap changer position, e.g., 2,732 A (65 MVA, 132-13.8 kV at 65 degrees C). In addition, the manufacturer must size the high voltage primary winding accordingly.

38. The transformer and tap changing equipment shall provide rated power (MVA) output at 0.8 power factor on all tap positions rated above the nominal rated voltage, when operating at the nominal rated voltage.

39. All the necessary tap changer equipment shall be mounted outside of the main transformer tank. The tap changer compartment shall be located no more than one foot below the top cover to minimize oil spillage should the tap changer barrier board and compartment doors rupture.

40. Oil communication between the transformer main tank and the tap changer compartments shall be prevented by the use of a barrier. The tap changer equipment (except vacuum type) shall have transfer switches housed in a compartment separated from the tap changer selector and reversing switches so that there will be no oil interchange between these switches. Arcing contacts in the selector compartment are not permitted.

41. The tap changer compartment(s) and barrier between the main tank and the selector must be able to withstand a pressure difference of 14.7 psi. In addition, all compartments

(main tank(s), selector and diverter) shall be braced to withstand a full vacuum individually plus the head of oil in the main tank.

42. To facilitate the initial oil filling of the main tank and tap changer selector compartment, 1-inch minimum piping with a valve is required between the main tank and selector compartments. The valve will be closed during normal operation of the unit.

43. All contacts of the tap changer and associated equipment shall be readily accessible and designed to require minimum maintenance. Hinged doors on the side of the tank shall be provided for this purpose on the selector and transfer switch compartments. The maintenance periodicity shall be stated for evaluation.

44. Arcing contacts shall be made of arc resisting material suitable for long life. They shall be mechanically capable of performing over 50,000 operations at full load without inspection and over 200,000 operations without having to replace parts.

45. The terminal board connectors on the barrier board(s) separating the tap changer compartment and main tank and winding leads shall be stamped with the identification of the leads and terminal board connectors, respectively, that are to be connected to them.

46. To remove the diverter switch for inspection, a removable lifting device and a mounting provision shall be supplied on the top cover. The lifting device shall be stored and mounted in a suitable location on the main tank while not in use.

47. For vacuum and reactance type tap changers, support braces shall be provided under the selector and transfer switch compartment hinged doors to accept a Company supplied "cat-walk."

48. For purposes of inspection or repair, it shall be possible to operate the tap changers electrically when the transformer is de-energized and the oil removed from the tap changer diverter switch and selector switch compartments.

49. This equipment shall be capable of changing taps at any operating position with maximum loading on the transformer as permitted by the latest ANSI Standard C57.92 entitled "Guide for Loading of Oil Immersed Distribution and Power Transformers".

50. A tap changer operation counter shall be provided and located in the mechanism housing. The counter is to be mechanically driven, not electrically.

51. The LTC motor mechanism shall be mounted no more than 5 feet above ground level and be provided with a window for local observation of the tap changer position indicator.

52. The load tap changing mechanism shall be designed so that in the event it should bind or jam, the linkage shall not break between phases; the motor drive shall stall, and

the motor shall be positively protected from failure due to overheating. The use of shear pins, friction clutches and thermal protective devices as protective devices are not acceptable.

53. The shaft of the load tap changer mechanism which runs external to the tap changer and is mounted on the tank wall and cover shall be enclosed in a protective metal shroud.

# LOAD TAP CHANGER CONTROL

54. The Company will provide the voltage source for the automatic regulating control equipment. A current transformer for the compensators used for automatic regulation shall be provided by the transformer manufacturer.

54.1 The ratio of the current transformer will be specified in the Detail Specification - Part II.

54.2 The current circuits shall be designed for 0.2 ampere operation.

54.3 The automatic regulation control equipment shall be suitable for either 66 V or 115 V, 60 hz input voltage from potential transformers.

54.4 The voltage regulator shall have an operating range of 100 to 135 V, ac.

55. The automatic tap changing equipment shall be suitable for stable operation without hunting when operating in parallel with other transformers. Parallel control of the tap changers shall be performed by the circulating current method.

56. The operating mechanism shall be designed to provide at the transformer, electrical operation (with the transformer carrying load) and manual operation (with the transformer de-energized); and it shall be designed so that it shall be impossible to operate the tap changer electrically during such manual operation. It shall also be impossible to operate the tap changers remotely during local operation.

57. A Selsyn, or equivalent, electrical transmitting, receiving and indicating equipment shall be provided for remote indication of the tap changer position. The indicating units shall be a nominal 4-1/2 inch in diameter and will be mounted by others on the Company's control board. In addition, a Selsyn or equivalent receiver position indicator shall be provided at the electrical control location in the main control cabinet of the transformer for indication. A mechanical position indicator shall be provided at the motor drive mechanism.

## EI-4161, REV. 3 JANUARY, 1993

58. Lights shall be provided in the LTC control housing to provide the following indications:

58.1 When passing from one tap to the adjacent tap.

58.2 When reaching each limit position.

58.3 When the tap changer is operated on local-automatic control.

58.4 When the tap changer is operated on remote control.

59. Provision shall be made for the remote indication of the aforementioned events by means of lamps to be furnished by others.

60. The LTC equipment shall be furnished with interposing relays for supervisory control of LTC equipment and individual 40 ohm tapped precision resistors for telemetering of LTC position to a remote location. The devices shall be wired to terminal blocks in the tap changer compartment.

61. The manufacturer shall supply a lockout relay to prevent paralleled tap changers from runaway conditions.

62. An adjustable device shall be provided suitable for obtaining a time delay in the range from 15 to 60 seconds during automatic operation in both raise and lower directions between successive tap changes as well as to the initial step of a tap change. Unless otherwise specified, this device shall be set for 60 seconds.

63. The manufacturer shall furnish the necessary auxiliary relays in the tap changer control circuit to provide for 3, 5 and 8 percent voltage reduction. The auxiliary relays shall have sufficient contacts to provide for supervisory indication and for by-passing the time delay relays. The exact scheme is given on attached Company Drawing No. B167934.

64. The LTC equipment shall be arranged so that in the event power is lost during tap change operation, the LTC shall go the back to the tap position before the power loss or the next lower tap position.

65. Provision shall be made for the de-energization of the automatic LTC control circuit by means of an auxiliary circuit breaker contact to be furnished by others. Refer to Company Drawing No. B167934 for the preferred arrangement. A "Local/Remote" control switch and "Raise" and "Lower" push button switches are to be located in the tap changer motor drive control cabinet.

66. The separate "individual-parallel" operation switch for parallel operation of the LTC equipment shall be mounted on the front panel of the control cabinet and shall be identified as follows:

## On Parallel Operation - Off Parallel Operation or Parallel Operation On - Off

67. An additional switch shall be provided marked "Manual-Automatic".

68. The tap changer motor drive control cabinets shall be mounted no more than 5 feet above ground level for field access to all areas of the cabinets, while the transformer is energized.

#### AUXILIARY POWER SUPPLY

69. The Company will provide two separate 120/208 volt, 60 hertz, 3-phase, 4-wire grounded wye-neutral supplies, one for normal use and one for emergency use.

70. The two 120/208 volt, 60 hertz, 3 phase, 4 wire wye grounded-neutral sources of power are for operation of the cooling equipment, tap changer and auxiliary equipment.

71. An ASCO mechanically latched, automatic transfer switch, Type 940, or equivalent approved by the Company shall be provided inside the control cabinet. See Con Edison Drawing No. B167935, attached, for a typical schematic. It shall be equipped with local signal lights indicating transfer switch position, and auxiliary contacts for annunciator alarm indication when the switch is connected to the emergency power supply and when it is returned automatically to the normal position.

72. One 125 volt dc ungrounded source of power is provided for operation of alarms and controls. For phase angle regulators and shunt reactors, a second 125 volt dc ungrounded source of power is provided for operation of the fault pressure relay which is be used to trip the equipment.

#### WIRING

73. All electrical control circuits shall be copper stranded wire with a minimum 600 volt Class insulation having oil resistant insulation and flame resistant finish. The wire insulation shall be solid, continuous sheath, flame resistant, cross-linked polyethylene (SIS). General Electric Company Type XhhW rate VW-1, SIS 8768 Vulkene gas and oil resistant or Dupont Tefzel insulated, Type XTF rated 600 volt, 300 degrees F wire may be used.

73.1 All electrical control circuit wiring shall be a minimum No. 14 AWG.

73.2 The current transformer secondary wiring shall be a minimum No. 12 AWG.

74. Splicing of current transformer pigtail wiring and wiring to main control cabinet is not permitted. A junction box with terminal blocks shall be used.

75. Single conductor wires shall be used on all power circuits. The paralleling of several equivalent smaller wires in place of a single wire is not acceptable.

76. All control wiring shall be supplied with ring-type insulated terminals as per Plate No. 3008-2, Attachment No. 1.

77. All relays and other wiring devices shall have engraved plastic nameplates as per Company Drawing No. B190950. The nameplates shall indicate the device designation and functional description of the device's use, e.g., cooling equipment breaker. Nameplates are to be secured by screws. Adhesive on the back of the nameplates is unacceptable.

78. Terminal block arrangement and internal connections shall be in accordance with Company Drawing No. A239621 or A239576. The manufacturer shall mount and wire to his terminal blocks for Con Edison's external connections as shown.

79. All external wiring shall be enclosed in rigid metal conduit.

80. All wiring, e.g., current transformer wiring, located internal to the transformer tank shall be bundled and enclosed in rigid tubing of non-metallic type and oil resistant provided with non-screw type fasteners to the bottom of the top cover. Tie wrapping of the wiring supported off the tank cover is not acceptable.

81. Terminal blocks for relays, current transformers, and the Company's external control connections shall be provided and shall be States Company, Catalog No. ZWM 2500 sliding link type, with marking strips and no covers or P & S Type G with Melamine barriers and marking strips, selected to provide not less than 10 percent spare terminal positions on each block. The power terminal blocks shall be Square D Co. Class 9080,

Type GE-6, 4 point terminal, for 4/0 cable or equivalent. No terminal blocks, relays, etc., is to mounted on a swing panel.

82. Power circuit wiring and control wiring shall not be run through a common conduit and terminal blocks. Separate terminal blocks and conduit shall be provided for power circuits. This also includes the wiring troughs used in control cabinets.

83. All interconnecting power and control wiring to accessories, e.g., gauges, cooling pumps, fans, and between terminal or junction boxes from the main control cabinets shall be made by means of plug connectors approved by the Company. The manufacturer shall supply 10 percent extra connecting plugs and any special tools needed to insert and remove wire connections to these plugs.

84. All electrical connections from devices inside the main transformer tank shall be brought out through the top tank cover in oil-tight connections to test links enclosed in a watertight box having a removable cover, unless otherwise specified in Detail Specification - Part II.

## CONTROL CABINETS

85. Control cabinets shall be NEMA Type 3R hinged door enclosures with a lockable handle. Vents in the top and bottom of the cabinets are required.

86. The control cabinets shall be mounted no more than 5 feet above ground level for field access to all areas of the cabinets.

87. The bottom of the control cabinet shall have an undrilled removable plate. No valves, piping or other accessories shall be located underneath this plate. This area is reserved for Company control and power cable conduits entry.

88. A minimum clearance of 12-inches is required between the bottom of the terminal blocks and the bottom of the control cabinet.

89. Mounting of relays, space heaters and terminal blocks on the door of the control cabinet or swing panels is unacceptable.

90. Thermostatically controlled space heaters shall be provided in all control compartments. A control switch shall be provided to operate the space heaters in either thermostatic or manual control mode. The heaters shall be provided with guards for the protection of personnel.

91. An internal switch operated light and working receptacle shall be provided in each control compartment. In addition, heaters are not to be located cable wiring areas.

92. All compartment doors for control cabinet shall be arranged for padlocking. Separate boltable dog clips are not required.

## TANK CONSTRUCTION

93. The transformer may be utilized to replace existing transformers throughout the Company's system. Therefore, the manufacturer shall design the transformer based on the dimensional constraints and general arrangement drawings stated in Detail Specification - Part II.

94. The transformer, phase angle regulator and shunt reactor main tank and auxiliary compartments shall be fabricated of steel, oil tight and of welded construction. The top shall be welded, not bolted to the tank. If a load tap changer is required, all compartment shall be welded to the tank. All compartments shall be designed to withstand full vacuum.

95. The welded tank construction shall be designed and fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. In addition, where required, the equipment shall be stress relieved as a complete unit prior to final machining.

96. The interior of the main tank shall be painted with a non-hydroscopic white paint. Manufacturer shall ensure that the paint is non-toxic and compatible with long-term exposure to high temperature oil. In addition, the paint is not to deteriorate with temperature and release combustible gases.

97. Two 24-inch diameter manhole openings, gasketed and boltable, are required on the top cover of the transformer, located on diametrically opposite corners of the tank.

98. In addition, a oval manhole on the sidewall of the selector compartment is required. The manholes will be used by the Company to perform internal inspections of the complete transformer in the field. Where this is not feasible, the manufacturer shall list this as an exception to the specification. Bolted manholes located on the sidewall of the transformer tank may be acceptable when they are designed for welding as per Attachment No. 2.

99. No lead support structures or accessories shall limit entry into the unit for internal inspections.

100. The internal arrangement of the core and coil assembly shall permit personnel entry in the transformer for visual inspection of the complete core and coil assembly, series transformer, lead structure, etc. 101. All flanges, valve fittings, access openings, and accessories which are located on the main tank below the oil level shall be designed for and welded or brazed in the factory in accordance with Attachment No. 2.

102. Bushing pockets located on the sidewall of the tank for mounting of bushings are not acceptable.

103. Inspection manholes on the sidewall of the tank and LTC compartment shall be of bolted design suitable for welding in accordance with Attachment No. 2. The Company 104. will field weld an oil seal over the pockets to the tank flange. The manufacturer shall supply oil seal covers for field welding. This access opening sealing procedure does not apply to the LTC compartment hinged doors.

105. If the main tank has a shipping split, the permanent cover shall be designed to be bolted to the main tank using recessed gasket. A 1/4 inch steel enclosure shall be provided for field welding around the bolted cover to provide a positive oil seal (See Attachment No. 3 for details).

106. The base of the main tank shall be designed for installation on a flat foundation. In addition, the base is to designed to support the weight of the unit completely assembled including oil and capable of being moved by lifting and skidding.

#### JACKING AND LIFTING FACILITIES

107. To facilitate lifting and setting the main tank on the foundation, the following points shall be permanently marked on the main tank:

- Center of gravity point without oil.
- Center point of width, height and length.

108. The base of the main tank shall be provided with skid plates to permit movement in the horizontal direction. Lifting eyes and hooks shall have a minimum I.D. of 4 1/2 inches.

109. Main tanks with a shipping weight not exceeding 250,000 pounds and compartments that exceed 1,000 cubic feet shall have jacking pads protruding not more that 12 inches from the tank wall, have a minimum jacking contact surface of 10 inches by 10 inches and located approximately, but not less than, 16 inches above the base of the transformer. Pulling eyes shall have a minimum I.D. of 3 1/2 inches.

110. Main tanks and compartments with a shipping weight in excess of 250,000 pounds shall have jacking pad protruding 14 inches from the tank wall having a minimum horizontal contact surface of 12 inches by 12 inches. The pads should be located no less than 26 inches above the tank base. Pulling eyes shall have a minimum I.D. of 4 1/2 inches.

111. Steel brackets, minimum of 5 inches by 5 inches by 2 inches thick, shall be furnished, near the top cover and corners of the main tank, protruding horizontally and have one hole, centered, with a minimum I.D. of 1 1/4 inches for attachment of tie-rods for shipment.

# PHASE ANGLE REGULATING TRANSFORMER

112. A single tank to house the series and exciting transformer is preferable. If the shipping limitations can not be met with a single tank design, a two tank design consisting of a series transformer and an exciting transformer connected via throats is acceptable.

113. The throat design between the series and exciting transformers shall be three individual phase isolated throats with insulating panels between the series and exciting unit throats. An oil level gauge shall be provided on each throat. The manufacturer shall describe in detail the following information with regard to the throats:

114. Support details inside the throat and termination details at the series and exciting transformer wall feeding the throats.

- Indicate bus or cable in the throat.
- State the material and design of the throat panels.
- The throat will be a bolted design with provisions for a welded oil seal around the bolt flange.
- Methodology to compensate for oil expansion in throats.

115. The manufacturer shall describe in detail the throat and support scheme of the LTC leads between the two transformers.

#### SAFETY RAILS

116. For the purpose of providing safety to personnel working on the main tank, safety rail plates shall be welded on the top cover of the main tank. Company supplied safety railing will be installed when personnel work on the top cover.

116.1 The plates shall have two pipe sections spaced 4 inches apart between pipe centers.

116.2 On each end of the plate, a channel capable of accepting a 2 inch wide kick plate shall be provided. The length of the channel shall be 4 inches.

116.3 Pipe section shall have a length of 8 inches with 1 3/4 inch I.D.

116.4 The pipe shall have a hole drilled at the bottom for drainage of water.

116.5 Plates shall be welded along the perimeter for 5 foot length safety rails.

116.6 On transformer with double wall construction, the above pipes will be placed on the outer wall.

#### GASKETS, FITTINGS AND FLANGES

117. All flanges, valve fittings, compartments and accessories which are removed for shipment or are to be installed in the field shall have bolted connections using recessed retained type reusable gaskets made of viton or nitrille rubber.

118. All generator step-up transformer primary bushing gaskets shall be viton rubber. Gaskets consisting of cork material are not acceptable.

119. All doors, inspection, manhole and handhole covers shall be gasketed with recessed retained type, reusable gaskets using bolted type construction.

120. All openings on the sidewall of the main tank(s) shall be designed for welding in accordance with Attachment No. 2 and the Company will field weld these covers to the tank. The manufacturer shall supply the covers for field welding.

121. One 4-inch diameter nipple welded to each main tank top cover and located on the diametrically opposite corner of each main tank fill valve is required. This fitting will be utilized to evacuate the transformer through a 4-inch diameter valve supplied by the Company. When evacuation is complete, the 4-inch diameter valve will be removed and a permanent cap will be installed. The manufacturer shall supply the 4-inch diameter cap to fit the nipple. This fitting shall be clearly identified using an oil resistant engraved identification tag as "VACUUM CONNECTION".

122. On phase angle regulators, a 2-inch diameter nipple welded on each throat connecting the exciter and series transformer together shall be provided.

123. One 3/8-inch diameter tee fitting shall be provided on the tank cover. The fitting shall be located in-line and on the same side of the tank as the oil sampling valve. This fitting will be utilized to connect to a tygon tube from the oil sampling valve for oil level indication during oil filling and to attach a vacuum gauge during evacuation. This fitting shall be clearly identified using an oil resistant engraved identification tag as

## "VACUUM GAUGE AND TYGON TUBE CONNECTIONS".

#### VALVES

124. All valves shall be gate, globe or full port ball type. Butterfly or flapper type valves are unacceptable.

125. One 2-inch diameter drain valve is required for each main tank.

126. One 1-inch diameter drain valve is required for each accessory compartment, including tap changer selector compartment and throats on phase angle regulators connecting the exciter and series transformer together.

127. One 2-inch diameter fill valve is required for each main tank. The fill valve shall be located at ground level at one corner on the external side of the tank. The manufacturer shall then supply piping (with a 2-inch diameter) on the internal side of the tank sidewall and top cover such that oil entering the fill valve at ground level is channeled through the internal piping to above the core yoke structure. Holes shall be drilled in the piping so as to spray or "splash" oil onto the windings.

128. One 1-inch diameter fill valve is required for each each accessory compartment, including tap changer selector compartment and throats on phase angle regulators connecting the exciter and series transformer together.

129. One 1-inch diameter valve with piping is required between the top of the LTC selector compartment to the main tank. During dryout and oil filling of the unit, the valve will be opened to facilitate pulling vacuum on the selector switch compartment. Subsequently, the valve will be closed for normal operation of the transformer.

130. One oil sampling valve for each main tank and each oil filled compartment is required with the exception of the LTC contactor compartment. Swagelok Quick-Connects, SS-QC4-S-4HC and SS-QC4-B-4PM, shall be supplied on each oil sampling valve. Stainless steel 1/4 inch ID tubing shall also be supplied between the sampling valves and Swagelok Quick-Connects such that no personnel entry is required within sound enclosures.

131. All sampling valves shall be brought to one centrally located point and be accessible from ground level.

132. One 1-inch diameter valve is required on the top and bottom of each radiator bank header assembly.

133. All the above mentioned valves shall be clearly identified using oil resistant engraved nameplates as follows:

- Oil Fill Valve Main Tank
- Oil Fill Valve Series and Exciting Tank (Phase Angle Regulator)
- Oil Fill Valve Selector Compartment
- Oil Fill Valve Diverter Switch
- Oil Fill Valve Throat
- Oil Drain Valve Main Tank
- Oil Drain Valve Series and Exciting Tank (Phase Angle Regulator)
- Oil Drain Valve Selector Compartment
- Oil Drain Valve Diverter Switch
  - Oil Drain Valve Throat
  - Oil Sampling Valve Main Tank
  - Oil Sampling Valve Series, Exciting Tank (Phase Angle Regulator)
  - Oil Sampling Valve Selector Compartment
  - Oil Sampling Valve Throat
  - Gas Collection Relay

134. Upper and lower shutoff valves which isolate each radiator bank from the main tank(s) are required. These valves shall be located on and welded to the main tank(s).

135. If the transformer is equipped with cooling pumps, shut-off valves are required on both the suction and discharge sides of each pump to facilitate the pump replacement without draining oil. Bleeder vents are required on oil piping and on each pump to provide for draining and oil filling.

136. One 1/2-inch diameter drain valve is required on each cooling pump to facilitate replacement of the pump.

### OIL PRESERVATION SYSTEMS

#### 137. Inert-Gas Pressure Type System

137.1 Automatic inert-gas pressure equipment with alarm contacts for high pressure, low pressure and empty cylinder alarms shall be provided. The gas control cabinet shall have a full length enclosure with provisions to retain the gas bottles and be open at the bottom to permit installation of the gas bottle at ground level.

137.2 The cabinet shall also have provisions for a second gas bottle which can be rolled into the cabinet without lifting.

137.3 The gas piping and associated valves shall be arranged so that each gassealed compartment may be separately filled and sampled from diagonally opposite corners. No valves shall be installed in the gas lines between the entrance to the main tank and the pressure switch for the low gas pressure alarm.

#### 138. Conservator Type Systems

138.1 Conservator type systems shall have no direct contact between the ambient atmosphere and oil. The conservator for the main tank shall utilize a bag and a silica gel breather. The tap changer diverter switch and selector switch compartments shall have separate conservator tanks or compartments with no common oil. Each conservator compartment shall have a silica gel breather.

138.2 The conservator shall be placed such that maximum operating oil level shall be no higher than the top of the cover mounted bushing adapters. If the manufacturer must mount the conservator above the height of the bushing adapters, an ELIN check valve between the main and conservator tanks is to be installed. Isolation valves shall be installed on both sides of the ELIN valve to facilitate replacement. An ELIN valve shall also be provided for the tap changer selector compartment connection to the conservator. The top of the radiator bank shall always be below the top of the cover mounted bushing adapters.

138.3 A Qualitrol gas accumulation relay, Bulletin QT2-038, that indicates the cubic centimeters of gas accumulation shall be provided. The device shall be mounted so that the accumulation gauge can be read and piping with valve provided so that the collected gas can be sampled from ground level.

138.4 A Qualitrol liquid level gauge is required for each conservator or conservator compartments. The device shall be mounted pointing downward at an angle such that the gauge can be read directly underneath the gauge. In addition,

Qualitrol Remote Reading Liquid Level Monitor, 039-Series shall be provided with each liquid level gauge; mounted adjacent to the main control cabinet(s).

#### COOLING REQUIREMENTS

139. Forced-cooling equipment shall be grouped electrically in not less than 2-groups per stage of cooling so that loss of any group will cause a negligible reduction in forced-cooling effect. Each group is to have individual motor contactor and breaker protection.

140. Triple rated transformers employing both pumps and fans, shall have the first stage of forced cooling consist of all pumps and a minimum number of fans to obtain the 133 percent rating. The second stage of forced cooling shall consist of the addition of fans only to obtain the 167 percent rating.

141. Automatic control equipment shall be provided for starting and stopping control for each stage of cooling.

142. The motors for the cooling equipment shall be three phase, 60 hz suitable for operation on a 208 volt plus/minus 10 percent system. All fans shall be equipped with guards having not more than 1/2-inch spacing in accordance with OSHA requirements. All fans shall be designed for outdoor use.

143. Cooling pumps shall be manufactured by Cardinal and J. W. Harley design. In addition, TecSonics bearing wear monitoring system shall be provided with each pump.

144. Provision shall be made for <u>only</u> de-energization of all cooling pumps upon deenergization of the transformer or phase angle regulator. The stopping of the cooling pumps is done to limit the assimilation of material throughout the transformer as the result of a fault or cooling pump failure, and limit oil spillage and fire spreading for a tank rupture. Cooling pumps will be turned on again, as required by loading, when the transformer is re-energized. Cooling fans shall continue to run and be controlled by the winding temperature, independent of cooling pump operation. The cooling pumps are to controlled by a "voltage present" detection relay, GE, Model No. 12HGA17A63 or equivalent. The relay will be connected to a potential transformers (connected phase-tophase), supplied by the Company. The pick-up of the relay shall be 48 volts (40 percent of the rated voltage, 120 V). The relay will pick-up with one-phase of the potential source out-of-service, e.g., blown fuse.

145. Cooling pumps shall be located on the lower portion of the cooler piping to facilitate maintenance and reduce outage time. Cooling pumps which have motors in-line with the normal oil flow are not acceptable. One oil flow indicator, manufactured by Qualitrol shall be installed in the oil line adjacent to each cooling pump. Alarm contacts shall be provided which will indicate failure of the oil pumps to operate when the cooling

equipment is energized. A time delay relay shall be provided to prevent unnecessary operation of the alarm during pump starting.

146. Radiators shall be free-standing and factory assembled in banks with all radiators of a bank welded to a common header.

147. All horizontal section of radiator piping shall have a vent plug on the top of each pipe section.

148. The radiator banks shall be provided with vent plugs on the high points of each radiator bank header and 1-inch valve on the top and bottom header pipe.

149. The radiator cooling piping flanges shall be designed for bolting to the transformer main tank.

150. Fans shall be factory mounted on the radiators with all wiring terminated in a control cabinet on the base of the radiator bank.

151. All misalignment or compensating piping used on the transformer shall be bellows type made of stainless steel. Dresser couplings are not acceptable.

#### ACCESSORIES

152. Standard accessories shall be furnished, such as winding and liquid temperature indicators with alarm contacts, winding temperature equipment to control the operation of forced-cooling equipment, magnetic oil-level indicators for all oil-filled compartments with low-level and high-level alarm contacts and, oil flow gauges with alarm contacts to indicate correct cooling pump operation.

153. All gauges and indicator faceplates shall be made of "Plexiglass" and equipped with protective screening. Glass faceplate is unacceptable.

154. The leads from all gauges shall be run to the main control cabinet in rigid metal conduit and be appropriately terminated. A short section of flexible Anaconda Seal-Tight conduit, maximum one foot, can be used on the device end.

155. Liquid Level Gauge

155.1 Oil liquid level gauge, manufactured by Qualitrol, is required for each oil filled compartment. A float type oil level gauge with alarm contacts for low and high oil level is required wired to the transformer annunciator.

155.2 For conservator preservation type system, a Qualitrol liquid level gauge is to be installed on each compartment of the conservator, i.e., main tank, selector compartment and diverter switch compartment. Since the conservator tank can be located above the radiators, reading of the gauge from ground level may not be practical. Therefore, remote reading Qualitrol Remote Reading Liquid Level Monitors, Type 039-Series are to be mounted adjacent to the main control cabinet.

155.3 All liquid level gauges shall be mounted such that the gauge is easily visible from ground level. Otherwise, the aforementioned remote reading liquid level monitor shall be provided.

155.4 On phase angle regulators using throats to connect the exciter and series transformer tanks together, each throat is to have a liquid level gauge.

156. <u>Temperature Gauge</u>

156.1 The liquid and winding temperature gauges shall be manufactured by Qualitrol. Temperature indicator scales shall go to 200 degrees C for winding and to 120 degrees C for liquid indication.

156.2 Separate sealed dry wells shall be provided for all temperature thermometers.

156.3 All temperature gauges shall be mounted adjacent to the main control cabinet(s).

156.4 The temperature gauges shall be set to alarm for the following temperature levels:

Temperature Gauge

Alarm Setting (Degrees C)

#### Liquid (Top-Oil)

•	High	90
•	High/High	115

Winding (Hot-Spot)

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EQUIPMENT	
STANDARDS	

٠	High	110
٠	High/High	135

156.5 The manufacturer is to provide winding temperature gauge calibration data for field checking of the gauge, temperature detector and auxiliary current transformer. This should include a sufficient number of heater coil current and corresponding temperature rise values to permit checking the instrument under varies top oil temperature conditions.

### 157. Fault Pressure Relay

157.1 The pressure relay shall be supplied with the Qualitrol, Inc., Series 909 seal-in relay suitable for 125 v dc operation. The seal-in relay shall be provided with the provision for automatic resetting by a remote contact supplied by the Company.

157.2 At least one fault or sudden pressure relay should be mounted on each main tank. In addition, there shall be one fault or sudden pressure relay on each LTC selector compartment, where applicable. These relays shall be located so as to be insensitive to the effects of cooler pump start-up and energization. The relay(s) shall be a Qualitrol Inc. Type 900-1 for flange mounting.

157.3 An isolation gate valve, e.g., Qualitrol, with flanges shall be provided between the tank and sudden pressure relay to facilitate testing and replacement of the relay.

157.4 For power transformers, the relays shall be wired for alarm purposes only to the annunciator.

157.5 For phase angle regulating transformers and shunt reactors the relays shall be wired for both alarm at the transformer annunciator and Company trip purposes.

#### 158. Pressure Relief Device

158.1 The pressure relief device shall be manufactured by Qualitrol with a mechanical long arm semaphore for visual indication of operation and alarm contacts.

158.2 Pressure relief device(s) shall be provided for each compartment. There shall be one pressure relief device for each 7500 gallons of oil or part thereof. Multiple pressure relief device alarm contacts on the same compartment are to be paralleled into a single annunciator alarm point. This device should reseal after the over pressure has been relieved.

158.3 If the design requires bushing adapters and a conservator type oil preservation system is used, then the relief device(s) for the main tank, throats and selector compartment shall be mounted no lower than highest point of the bushing adapter.

158.4 Pressure relief device shall be provided on each diverter switch compartment. "Blowout patch" or pressure relief diaphragm is not acceptable.

158.5 When more than one pressure relief device is required on the main tank, tap changer compartments and throats the alarm contacts may be wired in parallel to one annunciator alarm point for each oil compartment involved. However, there must be a separate alarm for each compartment and a separate annunciator point.

#### 159. Combustible Gas Monitor

159.1 A combustible gas monitor, e.g., Hydran 201 Incipient Fault Monitor, is to be mounted on the main tank at ground level to continuously monitor the gas concentration in the oil. The monitor shall be provided with two alarm contacts, one set connected to alarm on the annunciator.

160. Direct Winding Temperature Measurement

160.1 The hot-spot temperature of the main windings under normal and emergency operating conditions is to be measured and monitored using the Luxtron hot-spot detector. A fiber-optic temperature probe is to be embedded in the winding located where the temperature is the highest. In addition, a probe is to be located to measure the hottest oil temperature in a winding cooling duct.

160.2 For redundancy, two temperature probes are to be mounted for each application and brought out of the main tank through the pod.

160.3 The manufacturer is to submit data showing that the probes are located in the hottest point of the winding and oil.

160.4 The sensor probe and accessories located in the main tank are to be free of metallic parts and compatible with winding hot-spot temperature (200 degrees C).

160.5 Fiber-optic cable is to be protected in a rigid insulating tube and routed on the bottom of the top cover to the tank wall penetration.

160.6 The fiber-optic cables are to be brought out of the main tank through an oil-tight pod similar to that use for current transformers. The cables shall then be run to the main control cabinet and terminated for diagnostic monitoring by Company's temperature measurement instrumentation. If a separate control cabinet is supplied, the cabinet shall have a 120-volt 1-phase outlet, space heater and light.

160.7 Manufacturer is to submit a detailed description of the temperature probe and instrumentation to be used and experience list. Data is to be provided to demonstrate that failure of the probe and/or fiber-optic cable does not jeopardize the dielectric integrity of the unit.

161. Annunciator

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161.1 A local annunciator board manufactured by Seekirk, Inc. or Rochester shall be provided in the control cabinet. The control cabinet shall be provided with a window for local observation of the alarm indication lights, acknowledgment and maintenance at ground level.

161.2 The annunciators are to be accessible from the front for ease of field wiring and module replacement. The entire front panel is to be hinged swing type construction.

161.3 The annunciator shall be supplied with enough points to indicate a problem with the following items:

- loss of cooling supply
- loss of oil flow
- high liquid level
- low liquid level
- pressure relief device
- sudden pressure relay
- gas detector relay
- combustible gas
- high liquid temperature
- high/high liquid temperature
- high winding temperature
- high/high winding temperature
- high liquid level (diverter comp. and selector comp.)
- low liquid level (diverter comp. and selector comp.)
- pressure relief device (diverter comp. and selector comp.)
- sudden pressure relay selector comp.
- ac normal/emergency supply trouble
- auto regulation
- local control
- tap changer hang-up
- tap changer limit
- tap changer out-of-step
- tap changer loss-of-vacuum (if applicable)
- percent voltage reduction
- excessive oil flow conservator tank (ELIN valve)
- low nitrogen cylinder pressure

161.4 There shall be one alarm indication for each sensing device. Also, the annunciator shall alarm independently for alarms that are wired to the control room.

161.5 The annunciator system shall be designed to provide remote Company's alarm indication with normally open and normally closed contacts. Provisions shall be made so that any contact can be "field changed" from normally open to normally closed and vice-versa.

161.6 The annunciator system shall be provided with a "reflash feature" which permits acknowledgment of an alarm and permits resetting of the Company's remote alarm without affecting the local alarmed point on the annunciator. Upon the initiation of another alarm point, the Company's remote alarm shall be reactivated. The annunciator alarms shall only be cleared upon removal of the alarm condition.

161.7 The annunciator shall be designed so that no damage will occur if the input dc supply leads are inadvertently reversed.

161.8 Transients, noise, induced voltages and variations in dc supply voltage of +/- 10 percent shall not cause any alarms to operate.

161.9 When legend plates are provided for alarm description, they are to be laminated vinyl with black lettering against a white background, back engraved. The plates are to be secured by screws or studs. Pressure sensitive adhesive plates are unacceptable.

#### MISCELLANEOUS

#### 162. Core Ground

162.1 Core ground connection(s) shall be accessible for testing from outside of the equipment without the necessity of removing any manholes on the top cover. The core grounds shall be brought out of the top cover of the tank through a CT type pod and terminated in a box, then grounded with a removable external strap. Personnel entry in the tank is not acceptable in conducting the test. Separate core grounds shall be provided for main and series transformer cores. Manufacturer shall state in the proposal the method of core grounding used.

#### 163. Surge Arresters

163.1 Provisions for mounting surge arresters shall be supplied for the required bushing terminals and shall conform to the requirements specified below unless otherwise specified in the Detail Specification Part II.

163.2 The arrester mounting brackets shall be spaced to provide the clearance required from phase-to-phase and phase-to-ground.

163.3 A minimum of one NEMA ground pad shall be located on the top of the main tank for each arrester mounting bracket. The manufacturer shall also provide the necessary ground bus of at least 0.5 square inch cross section of copper between the above mentioned tank ground pads and the ground pads located at the bottom of the tank.

#### 164. Bushing Potential Devices

164.1 When this equipment is specified in the Detail Specification Part II, Class A devices will be provided, either a General Electric KA-108 or Westinghouse PBA-2 bushing potential devices.

164.2 The main tank shall include provisions to mount the bushing potential devices on either lengthwise side of the tank. The bushing potential devices will be installed on the side opposite the radiator banks. These provisions shall include device support brackets, and the secondary wiring and conduits required between the devices and the control cabinet. The bushing potential lead length shall be suitable for both mounting positions of the devices.

#### 165. Grounding

165.1 Two 4-inch by 4-inch flat finished copper or stainless steel surfaces shall be furnished on diagonally opposite sides of the transformer tank near the bottom for the connection of the Company's ground cables. These surfaces shall be drilled for 4 symmetrically placed 1/2 inch-bolts.

165.2 The transformer manufacturer shall furnish the necessary ground bus of at least 1.0 square inch cross section of copper or equivalent, between this flat surface and the neutral bushing, external neutral reactor and surge arrester ground pads if this equipment is furnished as part of the transformer.

165.3 The manufacturer shall also provide the necessary ground bus of at least 0.5 square inch cross section of copper or equivalent between the above mentioned tank ground pads and bushing potential device and external reactor

housing if the same are provided or if provisions to mount these devices are required with the transformer.

#### 166. Nameplate

166.1 The nameplate shall include the following information. In addition, to the information required by ANSI standards:

- Manufacturer and type of load tap changer, if applicable
- Main tank shipping weight without oil and oil-filled
- Radiator weight without oil and oil-filled
- Oil volume in main tank, selector and diverter switch
- compartments, and radiators
- Current transformer ratio at all taps
- and accuracy classification
- Maximum Sound level
- Year of manufacture

166.2 The nameplate shall also indicate the oil level in the main tank, conservator and all compartments, if applicable, from the top cover flange. This data is required to "dip stick" measure the unit to verify the oil level gauge accuracy. The change in oil level will be indicated per 10 degrees C change in liquid temperature.

166.3 Each bushing shall have a nameplate indicating the manufacturer, type, catalog number, and rating including its capacitance values and power factor.

# SOUND ENCLOSURE REQUIREMENTS

#### GENERAL

167. Since these transformers may be installed in a residential area, it is important that the noise level of the transformer, load tap changer, cooling equipment and all other accessories be maintained at a minimum. The sound level limits will be given in the Detail Specification - Part II.

#### **CONSTRUCTION**

168. The sound enclosure shall be of bolted steel construction, supported off of the main tank and completely watertight. If the enclosure is self-supporting, the structural steel framework will be bolted to the foundation using 5/8 inch by 3-inch, maximum, anchor bolts. On-site welding will not be permitted.

169. Sound deadening material shall be treated to be water-resistant and shall be fully contained within a metal enclosure. The metal enclosure shall have a panel with a minimum thickness of 1/8 inch.

170. All horizontal sections will be sloped to shed water. The sound enclosure shall have a roof section with vents. Access openings over manholes, core ground points, and LTC diverter switch are required. The roof shall have a structural design and non-skid platform, which permits six man work crews, and vacuum handling equipment, including a 1000-pound cold trap to be supported.

171. Scuppers to permit water drainage shall be located at a maximum of 1/2 inch above the pad surfaces. The scuppers will be of sufficient size and number to drain any fluid that might be discharged.

172. Access to the control cabinet doors will be through a hinged access door in the enclosure. The door shall latch in the full open position. This door will be complete with a heavy-duty latch, rubber gaskets and safety glass window through which all gauges will be visible without entry into the enclosure.

173. Bolt on access covers shall be provided for all valves, manholes and outlet boxes.

174. The sound enclosure may be shipped attached to the main tank if it is braced for railroad transport. Lifting lugs, pulling eyes, and jacking pads must have full access, and the base of the sound panels must be raised with respect to the main tank base such that the transformers can be skidded without damage to the sound panels.

175. The sound enclosure shall be completely assembled on the equipment on the factory floor and tested prior to shipment. A technical description of the sound enclosure shall be provided with the proposal.

176. The manufacturer shall supply detailed sound enclosure drawings for approval by the Company prior to an order being placed.

#### INTERNAL WATER DELUGE FIRE PROTECTION SYSTEM

177. The manufacturer shall provide a water deluge fire protection system for equipment using a self-supporting sound enclosure where there is more than six inches between the main tank and the sound panels. The fire protection system required inside the enclosure shall meet all requirements detailed in the City of New York Building Code, National

Fire Protection Association (NFPA), National Fire Code and National Board of Fire Underwriters.

178. Manufacturers shall supply all piping, fittings, valves, pipe supports, hangers, spray nozzles, and other items necessary to install the fire protection system. All piping and hardware shall be constructed to NPT standards. All electric equipment shall be mounted in Crouse-Hinds waterproof metal enclosures or boxes. Drawing of the support layout and details of the entire piping system shall be submitted to the Company for approval.

179. All piping, fittings, supports, deluge valves, etc., for the fire protection system shall be painted red. All galvanized surfaces shall be primed and treated to accept a painted finish. Field welding of pipe supports is unacceptable.

180. Piping shall be hot dipped galvanized electric resistance welded, Grade B, Schedule 40 conforming to ASTM Specification A-53.

181. Steel pipe hangers, clamps and other steel items used to support the piping shall be galvanized in accordance with ASTM standards.

182. All fittings shall be screw type, 150#, galvanized malleable iron (heavy class). All unions shall be 150#, galvanized, malleable iron, brass seat.

183. All flanges shall be 150#, cast iron, screwed flat face.

184. Brass-plain spray nozzles shall be provided. Brass nipples shall be furnished and installed with the nozzle so that the nozzles may be adjusted to the required position. Nozzles shall be installed such that maximum area can be wetted by the water spray. Spray nozzles shall be D3-65, 95 and 120 degrees C, Number 24 orifice size and manufactured by Grinell Co. or Company approved equivalent.

185. Fire detectors shall be fixed temperature, watertight and moisture-proof wiring conduit. The contacts shall be normally-open and close on temperature rise.

186. Manufacturer shall completely assemble the fire protection system in the factory and hydrostatic pressure tested. The fire protection system is required to withstand a pressure of 200 psig for four hours without any leaks or decay in pressure.

187. All flexible or compensating piping to the radiator banks and conservator to avoid transfer of sound from the main tank shall be bellows type made of stainless steel. No rubber material or dresser coupling is acceptable.

## **INSULATING FLUID**

188. A complete supply of oil shall be provided with each transformer to properly fill the main tank, tap changer diverter switch and selector switch compartments and all accessory compartments. The oil shall be delivered in tankers cleaned and properly sealed against contamination.

189. The oil shall be shipped at such times as the Company directs and on a schedule that permits a continuous filling operation. The manufacturer shall make provisions for the oil tanker to remain at the transformer location for seven (7) days while the oil is being loaded into the transformer.

190. The oil shall be shipped under a nitrogen blanket with a positive pressure on it at all times. The tanker shall have suitable gauges to monitor this pressure.

1	Acceptable Limits	AS	TM Method	
Dielectric Breakdown	30 kV min.		D877	
Dielectric Breakdown at 0.40 inch gap	30 kV min.		D1816	
Power Factor at 25 Degrees C 100 Degrees C	0.05 % max.		D924	<u>у</u> т. : ;
Interfacial Tension Neutralization Water Content Gas Content Color Visual Condition PCB Content	40 mN/m, min. 0.03 mg KOH/g max. 20 ppm max. 0.5 % max. 0.5 ASTM units max. Bright and Clear 1.0 ppm max.		D971 D974 D1533 D831, D2945, D1827 D1500 D1524 D4059	· .

## Criteria For Oil

191. If the oil as received contains foreign particles, excessive moisture or has a low dielectric strength, the oil may have to be treated to make the oil satisfactory for use or may have it returned to the supplier. The manufacturer shall incur the expenses of any treatment required.

## SPARE PARTS
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192. The manufacturer shall supply a list of recommended spare parts for the equipment. Attachment No. 4 shows the Company's minimum requirements for spare parts. The manufacturer, as an option shall quote prices for these spare parts.

### LONG-TERM STORAGE

#### GENERAL

193. When specified in the Detail Specification - Part II, the transformer will be prepared for long term storage.

194. Manufacturer shall provide installation and test instructions for long-term storage of the unit in the instruction manual. As a minimum, the requirements detailed in Attachment No. 5 are to be included. The instructions shall be submitted for review and approval. One copy of the instruction manual shall be packaged in the front of the cargo container.

195. Upon arrival to the storage facility, the transformer will be partially assembled, dried out and vacuum oil filled. The radiator banks are to be self-standing without their support structures and provisions shall be provided for mounting the expansion tank on either the radiator bank or the main tank cover to allow for oil expansion while in storage. There shall be a minimum 12 inches from the bottom of the radiator bank to ground. All shipping gaskets shall be made of nitrille rubber or equal.

196. All components and accessories except the following items shall be prepared for long-term storage and stored in a closed top container.

- Main tank jacking bosses
- Radiator bank(s) and support(s)
- One pressure relief device for each main tank, selector
- switch and diverter switch(es) compartments and associated stand-off piping
- Expansion tank and accessories including mounting
- brackets and main compartment air cell bag and silica gel breathers
- Oil fill, oil drain and oil sampling valves
- Inert-gas pressure type system cabinet and piping
- Oil level gauges for all compartments
- Accessories which exceed the internal dimensions of the container

197. The aforementioned items shall be packaged together and be readily available for installation. The packing crate(s) may be shipped in the container but <u>must</u> be located in the front of the container without moving any equipment.

#### CARGO CONTAINER

198. Construction shall be of steel having a manufactured date not to exceed five years earlier than the date of purchase by the manufacturer. Heavy-duty construction to accommodate double stacking, hoisting by straddle carrier and with pockets to lift with a forklift truck when fully loaded. Interior wood, plywood paneling or door fillers is prohibited. Flooring may be timber panels or planks, which are steel-riveted to the base frame. Sidewalls must have recessed louvered ports for natural ventilation, located at the top and bottom, covered with metal or fiberglass screening to prevent nesting of insects or entry of rodents. The doors are to be fabricated without any filler material. Door hardware is to be mounted securely to the door panel and frame. The container's base frame must be structurally sound and rust-free, coated with an undercoating.

199. Containers may be purchased from a "used" market, then refurbished to good condition without holes, dents, rust, etc. Door edges will be rubber gasketed with all handles, hasps and hinges in good working order and lubricated.

200. Container's maximum dimensions are 20 feet (long) by 8 feet (wide) and 8 1/2 feet (high). In addition, the container shall be Type A, "CLOSED-TOP" container with solid, non-vented roofing shall be provided. Double door access on one end with rain shield over the doors is required. The double doors shall have provisions for pad locking.

201. Type B, "OPEN-TOP" containers with removable door-headers and tarpaulin with braces shall be provided to store <u>only</u> sound enclosure panels.

202. All interior and exterior metal surfaces of each container shall be primer coated as required, then painted dark-gray, ANSI 24, excluding the underside of the container. The roof surfaces will be weatherproofed by application of a "mobile trailer aluminum asphalt root-coating".

#### QUANTITY

203. The number of containers furnished per transformer shall be determined by the cubic footage and weight distribution required to stow accessories.

#### PACKING AND STOWING

204. All components of the transformer that are removed for shipment of the main tank, radiators and conservator will be containerized.

205. The accessories shall be segregated and stowed by functional description and packed in reverse order to their installation. For example, all bushings and their adapters in the same container; load tap changer motor drive cabinet in front; and first accessories required during installation shall be in the front with the last item, e.g., fire protection system material in the rear.

206. All accessories will be crated, palletized and metal banded.

## NO CELLULOSE PACKING MATERIAL IS ACCEPTABLE.

207. Maximum use of "runners" on crates, loose items, etc. shall be used to facilitate handling with a forklift truck and stacking of crates.

208. All accessories which require periodic inspection, e.g., storage of bushing adapters with dry air or nitrogen which require periodic monitoring of gas pressure, shall be accessible for inspection. Pressure gauge shall be installed on all gas filled accessories and oil level gauge on all oil filled accessories.

209. Sound enclosure panels shall be placed in a vertical position and secured.

210. The placement of crates shall be to evenly distribute the weight in the container and the total weight shall not exceed the load capacity of the container.

211. All contents within the container must be braced and blocked to prevent load-shift during transportation

212. Insects, infestation, borer-holes, etc., of crating, dunnage, containers and their flooring is unacceptable. Fumigation any/or any other required compliance to federal or local regulatory agencies at port of US entry or upon delivery to Con Edison will be the responsibility of and paid for by the manufacturer.

#### DOCUMENTATION

213. A packing list will be provided which provides an itemized description of the contents of each crate or accessory in the container. The packing list shall indicate the weight and dimensions of each crate or accessory.

214. A drawing showing the plan view and side elevation view will be provided showing the location, identification, weight and dimension of all items in the container.

215. Each crate or accessory will be marked with an identification number, weight and dimensions of the item.

### PAINTING

216. The transformer tank(s) and all the accessories shall be prepared and painted in accordance with the Con Edison Specification No. CE-TS-07. All radiators shall be painted by the flow or dipping method; spraying or brushing will not be accepted.

217. The paint color shall be US Federal Standard 595A26120 (Dark Gray Brown) or Pittsburgh Paint Color D4639 (Forest Brown), unless otherwise stated in the Detail Specification - Part II. The manufacturer shall also supply with their proposal sample paint chip.

## FACTORY TESTS

218. The manufacturer shall make certified factory tests in accordance with the latest ANSI or IEEE Standards and such other customary factory tests as may be necessary to assure that all equipment is satisfactory and in accordance with this specification. In addition, the following specific test shall be made and three copies of certified factory test reports shall be submitted for the Company's approval prior to shipment release. A copy of the transformer nameplate drawing shall be included with each copy of the certified test report. Nameplate drawing shall be completely filled in and shall contain all information contained on the metal transformer nameplate.

#### TEST ON ALL TRANSFORMERS (PRODUCTION TESTS)

219. Core loss as follows:

- On rated voltage tap position
- With the de-energized tap changer on the neutral position and the LTC on the maximum no-load loss position. State these loss positions in the test report.
- With de-energized tap changer and LTC on positions occupied during heat run.

220. Copper loss at the full load self-cooled rating and at the full load forced-cooled rating:

- On rated voltage tap position.
- With the de-energized tap changer on the neutral position and the LTC on the maximum
- copper loss position. State these loss positions in the test report.
- With the de-energized tap changer and LTC on positions occupied during heat run.

221. Exciting current at rated voltage.

222. Positive, negative and zero sequence through impedance and reactance, based on the self-cooled rating and 55 degrees C temperature rise rating for the following conditions:

- With the de-energized tap changer on the maximum rated and minimum voltage positions and the LTC equipment held on rated voltage position.
- With the LTC equipment on the maximum and minimum voltage positions and the de-energized tap changer held on the rated voltage position. State in the test report what
- combination of de-energized tap changer and LTC voltage positions give maximum impedance value and what this value is.

223. The sound level test shall be performed at highest rating with all fans and pumps running. Both sound power and pressure level measurements shall be made. One-third octave band frequency measurements shall be performed at frequencies from 63 to 4000 hertz. The sound level test shall be in accordance with ANSI/IEEE C57.12.90, with all the magnetic circuits fully energized.

224. Impulse test and switching surge test.

225. A three-phase induced potential test: The test voltage shall be brought up to 150 percent of the maximum system operating voltage and a partial discharge measurement recorded. The test voltage shall then be raised to 175 percent of the maximum operating voltage for 7200 cycles. Record the partial discharge level. The test voltage shall then be returned to 150 percent of the maximum system operating voltage and held for one hour with partial discharge measurements recorded. Unless otherwise stated in Part II of the Detail Specification, the corona level shall not exceed 500 microvolts at 175 percent of the maximum operating voltage. Partial discharge levels shall be recorded at five-minute intervals for the duration of the test. Continuous RIV monitoring shall accompany these tests and a satisfactory RIV must show a constant or downward trend during the one hour 150 percent voltage test. A combustible gas-in-oil analysis shall be made both before and after this test, and the results reported. It should be noted that the maximum operating voltage is defined as 105 percent of the rated system voltage.

226. Ratio test on rated voltage connection and all tap positions.

227. Phase relation test.

228. 120 Volt, 60 Hertz, 1 phase excitation test on each winding. Wye connected winding shall be tested line end to neutral. The test shall be done with the tap changer in 1R, neutral and 1L positions. In the case of a two winding transformer the test should be done from the primary with the secondary winding open circuited and vice versa.

229. 10 kV, 60 Hz, Doble power factor test on both the high and low voltage windings.

230. 10 kV, 60 Hz excitation current test on each high voltage winding.

231. A dc dielectric proof test for 5 minutes on each winding is required. Microampere readings shall be recorded every 60 seconds.

232. Bushing

- ANSI Standard production test
- Capacitance and power factor data. All oil impregnated paper bushings rated below 230 kV shall have a power factor below 0.5 percent and below 0.35 percent for bushings
- rated above 230 kV.
- Partial discharge (corona) test at rated line-to-ground voltage and at 150 percent of that voltage
- Bushing potential device capacitance data

233. Certification that all gauges and contacts have been calibrated. The final contact settings shall be listed.

233.1 The manufacturer shall furnish the necessary data to enable the Company to make a calibration check on winding temperature indicators and thermal relays. This should include a sufficient number of heater coil current and corresponding temperature rise values to permit checking the instruments in place with top oil temperatures as low as 0 degrees C and as high as 50 degrees C and with circulating oil pumps (if any) not running.

#### **TESTS ON APPROVED DESIGN**

234. Heat runs at 65 degrees C, self-cooled rated capacity, and at 65 degrees C Rise, maximum rated capacity, until constant temperatures are obtained. Both heat runs shall be made with the de-energized tap changer and LTC equipment on the voltage taps which correspond to <u>maximum</u> transformer loss positions at 0.8 power factor load while holding the transformer output voltage to its rated value. Rated value is defined as the no-load voltage in the secondary with rated voltage applied to the primary with the de-energized tap changer and LTC both on neutral positions. The de-energized tap changer and LTC tap positions during these tests shall be stated in the factory test report, together with the winding average, hot-spot temperatures, and top oil temperature rise.

235. The following data shall also be included on the certified test report.

- Combustible gas-in-oil analysis before and after the heat run test(s)
- Oil rise vs. per unit loss curve (log-log) (M-exponent)
- Winding rise vs. per unit current curve (log-log) (N-exponent)
- Oil rise vs. time curve (semi-log) (time constant)
- Hot spot conductor temperatures rise over average winding rise at full load.
- Top and bottom oil temperature rise over ambient temperature
- Average winding temperature rise over ambient temperature
- Top Oil temperature thermal time constant
- Winding temperature thermal time constant
- Calibration and base-line thermal data for winding hot-spot temperature and oil temperature measurement probes.

# CONSTRUCTABILITY

236. The transformer will be evaluated on the basis of installation assembly time and procedure. The manufacturer shall submit a separate section in the proposal detailing all components which are shipped loose and which require assembly, the steps being considered to facilitate minimizing installation time and shall include the following specific information in his proposal:

• The estimated total normal time or man-hours required to assemble and test the transformer. This time shall be expressed in the number of work shifts required for each of the following: rigging, mechanical assembly, electrical assembly and testing.

• The list of items which must be assembled in the field.

• The manufacturer shall ship the main tank with gas cabinet, control cabinets, gauges, valves, and load tap changer, including motor-drive attached if the shipping dimensions permit.

# MAINTAINABILITY

237. The transformer will be evaluated on the basis of maintenance inspection frequency and requirements. The manufacturer shall submit a separate section in the proposal detailing inspection interval, maintenance procedure, test, and replacement criteria and procedure for all components of the transformer.

# SHIPPING INSTRUCTIONS

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238. Where bushings are removed for shipment, the corresponding winding leads shall be grounded to the bushing shipping cover of the transformer. In addition, all bushings are to be grounded to the tank wall for shipment and storage.

239. Manufacturer shall make shipment only after the Electrical Substation Equipment Subsection of Electrical Engineering Department has approved test results. The manufacturer shall be responsible for the preparation of the unit for shipment in a manner governed by the mode of transportation.

240. The manufacturer shall ship this equipment factory assembled to the maximum extent possible, consistent with railroad and trailer limitations. Local shipping limitations are as indicated in the Detail Specification - Part II.

241. The unit will be shipped with dry air. The manufacturer will verify that the unit contains a minimum of 19.5 percent oxygen content and maximum 21 percent before shipment. The combustible gas content shall be less than 0.5 percent. On the top of each manhole the following: will be clearly painted

#### "HARMFUL ATMOSPHERE! DO NOT ENTER!"

242. Transformer dry air pressure, oxygen content, moisture level, gas-in-gas analysis for quantity of combustible gases, including carbon monoxide and carbon dioxide, and temperature data, recorded immediately prior to shipment, shall be sent to the Electrical Substation Equipment Engineer.

243. Three copies of the complete packing list for the transformer and parts shall be sent to our Construction Department, Construction Services Section, prior to shipment of the unit. Two additional copies shall be sent to the Electrical Substation Equipment Subsection. Packing list is required at time of shipment. Receipt of equipment will not be accepted if list is not received prior to delivery.

244. Each transformer part shipped loose and all crates shall be marked with an identifying sequential numbering system prior to shipment. The applicable identifying "package" number shall also be recorded against each item on the packing list. The packing list shall identify the quantity, part number and description of each item.

245. One copy of this finalized packing list shall be affixed to the outside of each loose piece, box, etc., in a weatherproof envelope and four copies shall be mailed to our Expediting and Traffic Bureau.

246. Each box or crate of transformer parts shall be stenciled with the manufacturer's recommended storage instruction indoors/outdoors relative to their content.

247. Steel tie-rods, used to brace the transformer on the rail car, shall have a minimum diameter of 1 1/4 inch.

248. Handling of the transformer during transit shall be monitored by impact recorder(s), furnished by the manufacturer, having a minimum 60 days/2-way capability. The impact recorder shall have a quality control certification date label attached on the unit. The impact recorder shall be mounted on the transformer, not the railroad car, if applicable. Recorders furnished by the Railroad Company are unacceptable.

249. Transformers or their parts shall not be rendered to a carrier without 48 hours prior notification by the shipper to our Expediting and Traffic Bureau and receipt of verbal authorization to ship.

### DRAWINGS, INSTRUCTION MANUALS AND PHOTOGRAPHS

250. Drawings and manuals of instruction furnished under this Specification shall be in accordance with the latest revision of Specification EI-4008.

251. Manufacturer shall provide installation and test instructions for assembly, dryout and testing the unit in the instruction manual. The instructions shall be in accordance with Company's Electrical Engineering Specifications EI-1002, Specification For Proof Testing of Station Electrical Equipment and Circuits, and EI-1003, Installation and Test Specification for Oil-Immersed Power Transformers, Reactors and Regulators. The instructions shall be submitted for review and approval. One copy of the instruction manual shall included in the control cabinet.

252. The following data is required in the instruction manual:

252.1 An itemized list of components

252.2 All parts and apparatus external of the main tank including the quantity of each item. Indication of whether items are non-removable. Indication of those items which are to be removed for shipment. Parts of the transformer to be removed for shipment shall be indicated by an asterisk (\*) in the itemized description list shown on the outline drawing.

252.3 Indication of whether main tank is shipped dry-air or oil filled.

252.4 Certify shipping weight of main tank, radiator or cooler bank(s) and expansion tank, if applicable.

252.5 Drawing showing a "Side" and "End" view of main tank, plus radiator or cooler bank(s) and load tap changer compartment (if shipped removed) as they are disassembled for shipment. Include as much dimensional shipping data as possible:

- Show maximum shipping height, length and width of main tank(s), radiator or cooler bank(s), expansion tank(s) and load tap changer (when shipped separately). Shipping height to be less sub-bases which are shipped separately. Indicate the Bill of Material number of the highest accessory, not removed for shipment.
- Show base length and width of main tank, including valves, etc.
- Show height from base line of main tank up to base of, or lowest mounted accessory to, the load tap changer, control and inert air cabinets.
- Show all primary lifting points.
- Show length and width dimensions between centers of lifting points.
- Provide detail sketch of each itemized lifting point (lug or capstan) including distance from base of lifting point to top of cover.
- Show centerline of main tank, radiator banks, and load tap changer, if shipped separately.
- Show shipping centerline of gravity of main tank, radiator banks and load tap changer, if shipped separately.
- Show centerline of gravity of main tank when oil filled.
- Provide detail sketch of each itemized jacking point (bracket or boss), including distance from bearing surface of jacking point to baseline of main tank and load tap changer, if shipped separately.
- Outline drawings shall also indicate the dimensions shown in Attachment No. 6.

• The weight and dimension of all bushings shall be added to their itemized parts description list if the main tank has shipping split, a detail-shipping sketch of the permanent cover shall be provided.

253. Three (3) sets of 8 inches by 10 inches photographs showing general construction and arrangement of components shall be supplied with each transformer and shall include the following:

- Core structure before coils are in place (core form units only).
- Core and coil assembly-showing details of coil bracing before LTC cabling is installed.
- Empty tank.
- Core and coil assembly before tanking showing details of cable bracing.
- Completely assembled core and coil assembly before tanking.
- Top view of transformer before main tank cover is welded on showing placement of core and coils, series transformers, preventive autos, etc.
- Overall external view of completely assembled transformer.
- Sound enclosure assembly (if applicable).

# **GUARANTEE AND WARRANTY**

254. The equipment will meet all requirements of the specification and will give long, safe, and dependable service.

255. The manufacturer will repair or replace the equipment or any parts which are found to be defective in material or workmanship within 12 months from date of energization or 18 months from date of Company's receipt acceptance of the main tank and accessories, whichever occurs sooner.

### **EXTENDED WARRANTY**

256. The manufacturer is required to submit a quotation for in-and-out warranty for 36 months from date of energization or 42 months from date of Company's receipt and acceptance of the main tank and accessories. The Company reserves the right to purchase the above warranty at its option.

### INSPECTION

257. In case the Company wants to inspect the equipment before shipment from the factory, the Company's representative shall be allowed free access at all reasonable times to the manufacturer's shop. Failure of the Company's representative or inspector to call

attention to any defect in material or workmanship shall not be construed as acceptance of the same.

## PROPOSAL DATA

#### GENERAL

258. The manufacturer shall submit a complete proposal covering equipment complying with this specification and containing all of the information requested in Part III. The manufacturer shall tabulate all data as required on the forms supplied in Part III, and return these forms complete with his proposal. The manufacturer shall supply one priced copy for the Purchasing Department and five unpaired copies of the proposal for technical review.

## NO CONSIDERATION WILL BE GIVEN TO AN INCOMPLETE PROPOSAL.

259. In case, the proposed equipment duplicates or is similar to that furnished by the manufacturer on a previous order, reference may be made to the previous order but such reference alone will not be accepted as constituting, nor as a substitute for a complete proposal. If a choice of propositions is offered, the main proposal shall comply with this specification and all others shall be alternates.

### **EVALUATION OF PROPOSALS**

260. All accepted proposals will be compared on an economic basis to determine the penalty to be applied against each proposal. To guide the manufacturer in distributing losses, the load value for evaluation and the capitalized value of core and copper loss will be supplied in Detail Specification - Part III. It should be noted that the losses will be evaluated at the maximum loss tap changer tap position(s) and at the maximum 65 degrees C nameplate rating.

261. The loss evaluation is calculated by the annual cost method. The transformer annual fixed charge rate is carrying charge rate times the final adjusted price of the transformer, including any estimated price escalation to the time of delivery. The cost of energy for no-load and rated load will be added to the annualized adjusted price of the transformer.

262. A first cost loss penalty will be assessed against the transformer capital cost when the tested losses exceed the guaranteed losses. The penalty shall be the difference between the tested total evaluated annual losses cost and the specification guaranteed evaluated annual losses cost divided by the carrying charge rate.

263. No credit shall accrue to the manufacturer if the total evaluation for tested losses is less than the total evaluation for guaranteed losses.

### STATEMENT OF EXCEPTION

264. In case the manufacturer wishes to take exception to any of this Specification, he shall state in his proposal the points of variation between his proposal and the Specification and the reasons therefore. Any statement in his proposal or on his drawings which differs from the requirements of this Specification, must be specifically referred to in a "Statement of Exceptions" to be considered as constituting an exception to the Specification.

#### D. Chu

Leo S. Savio Engineering Section Manager Equipment & Field Engineering

FILE: Electrical	
Substation & Transmission	
Engineering Section - Maintenanc	ė
and Test Standards File	

#### Attachments

REVISION 3: General Revision

No. 1	Plate No. 3008-2
No. 2	Tank Wall Access Opening Sealing Procedure
No. 3	Shipping Split or Throat Sealing Procedure
No. 4	Spare Parts List
No. 5	Long Term Storage Requirements
No. 6	Outline Drawing Dimensional Requirements

#### Attached Specifications

EI-4008General Specification For the Provision of<br/>Manufacturer's Drawings and Instruction Books<br/>and Test Reports For Electrical EquipmentCE-TS-07-84Approved Coatings to be Used on New Electrical<br/>Equipment

Attached Company Drawings

EQUIPMENT STANDARDS	EI-4161, REV. 3 JANUARY, 1993
A239621	Terminal Block Arrangement for 345/138 kV Transformer
A239576	Terminal Block Arrangement for 138/13 kV and 138/27 kV
	Transformer
B190950	All Stations Relay Board Nameplates
B167934	Schematic Diagram of Typical Tap Changer Control
B167935	Schematic Wiring For Oil Insulated Transformers Cooling
	Equipment
B239506	Transformer Paralleling Standard
C239482	List of Alarms for Transformer Annunciators

#### ATTACHMENT NO. 1

Control Cable Terminations .pa .ce3 ATTACHMENT NO. 2

Tank Wall Access Opening Sealing Procedure

.pa .ce3

ATTACHMENT NO. 3

Shipping Split or Throat Sealing Procedure .pa .ce2 ATTACHMENT NO. 4

Spare Parts List

2

1^^-^High voltage bushing

1^^\_A use bushing (secondary and tertiary)

1^^\_Neutral bushing

1^^-^^Bushing potential device with lead

10^-^^Annunciator modules

1^^-^^Complete diverter switch assembly

1^^\_^Set of interrupter contacts or set of transfer switches

^^^^for all three phases

1^^\_^Set of reversing switch contacts, moving and ^^^^^stationary

1^^\_^Set of selector switch contacts, moving and ^^^^^stationary

1^^\_^Tap changer barrier board separating main tank and ^^^^^ selector compartment

1^^-^Tap changer motor drive assembly

1^^-^Voltage regulating relay

1^^-^Complete set of fuses for control and tap changer

1^^\_^Auxiliary current transformer(s) for tap changer

1^^-^^Qualitrol liquid temperature gauge

1^^-^^Qualitrol winding temperature gauge

1^^-^^Qualitrol gas collection device

1^^-^^Qualitrol fault pressure relay with seal-in circuit

1^^-^Qualitrol flow gauge

1^^\_^Cooling pump

1^^-^Cooling fans

1^^\_^Motor contactors used to control cooling equipment

1^^-^^Main incoming ac power circuit breakers

1^^-^Tap changer circuit breaker

1^^-^^Cooling equipment circuit breakers

## ATTACHMENT NO. 5

#### Long Term Storage Requirements

#### General

The unit is to be received and stored in accordance with the following:

- The unit is to be checked against the purchase order and specification for conformance and completeness.
- Electrical Engineering Specification EI-1003, EI-1005 and EI-4161, Long Term Storage Section; latest revision.
- Corporate Instruction CI-330-11.
- Engineering Receipt Inspection Report Manufacturer's Outline Drawing
- Manufacturer's Component/Parts Material List

Install mechanical pressure relief devices with adapters/turrets.

The Electrical Substation Equipment Subsection is to be notified of the progress of work, tap changer inspection and test results.

The Transportation and Stores Department will insure that the following is completed for turnover:

- Photographs are required of this unit, as stored, from opposite diagonal directions, the top cover and any additional photographs which may be required of the control cabinet to document their condition.
- A complete turnover history jacket shall be prepared with all test results, unit information, photographs and inventory. A copy of this history jacket is to be provided to the User Department, Stores and the Electrical Substation & Transmission Engineer.
- A turnover memorandum is to be prepared for the subject unit that will include a check-off of the above items and a joint unit inspection report by representatives of the User Department, Stores, Construction and Engineering Vice President signatures.

#### Assembly and Oil Filling

For long term storage, the transformer has to be partially assembled without the bushings, if shipped separately. The sequence of assembly of parts is a follows:

• Position the main tank on its foundation.

- Place radiator banks or cooler banks on their transport supports on the HV or LV side of the main tank.
- Install mechanical relief devices on tap changer diverte and selector switch compartments and the main tank. Install standoff pipes, if provided.
- Mount the conservator tank, if applicable, on the corresponding radiator bank(s) and make all connections between flanges on pipe ends of the banks and conservator using 1-inch pipe.
- Make 1-inch pipe connections between radiator banks and main tank.
- Make 1-inch pipe connections between tap changer (LTC) conservator compartments to respective diverter switch and selector switch compartments.

#### Note:

All shipping covers or flanges shall be removed from the transformer or radiator banks prior to drilling or welding.

Dryout and oil filling shall be done in accordance with EI-1003. When the Electrical Substation Equipment Sub-Section has approved hot-oil dryout, 10 percent of the main tank oil shall be circulated.

After oil filling, all silica gel dehydrating breathers are to be installed.

:eol. .pa .ce3 ATTACHMENT NO. 6

Outline Drawing Dimensional Requirements

ELECTRICAL ENGINEERING DEPARTMENT ELECTRICAL SUBSTATION AND TRANSMISSION ENGINEERING SECTION SPECIFICATION NO. EI-4161, REV. 3 JANUARY, 1993

## PART I

# GENERAL PURCHASE SPECIFICATION FOR LARGE POWER AND PHASE ANGLE REGULATING TRANSFORMERS AND SHUNT REACTORS

## SCOPE

1. This general specification together with the Detail Specification Part II covers the technical requirements for oil-filled power transformers, phase angle regulating (phase shifting) transformers and shunt reactors for installation at various locations of the Consolidated Edison Company of New York, Inc., herein referred to as the Company.

## **STANDARDS**

2. The item "Standards" whenever used in this specification, refers to the latest applicable Standards published by the American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE) and National Electric Manufacturers Association (NEMA). Except as otherwise specified or as modified in this specification, all apparatus furnished herein shall conform to all applicable requirements of the aforementioned Standards, in particular ANSI C-57 series, whether or not specifically mentioned, and the administrative Code of the City of New York.

### SERVICE CONDITIONS

3. The equipment shall be suitable for the following service conditions, unless otherwise indicated in Detail Specification - Part II.

- Outdoor, sheltered louvred vault installation
- Ambient air temperature range from minus 30 degrees C to plus 40 degrees C (minus 22 degrees F to plus 104 degrees F).
- Exposure to solar radiation.
- Located at essentially sea level.

### **DESIGN REQUIREMENTS**

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## GENERAL

4. The transformers shall be outdoor type, oil immersed. The ratings and winding connections shall be as indicated in the Detail Specification - Part II.

## **VOLTAGE LIMITS**

5. The equipment shall be capable of:

Nominal	Voltag	e Limits	Duration
System Voltage (kV)	Range	Minimum	(Minutes)
	(KV)	(kV)	
	Over 160	-	0
	153-160	-	10
138	146-152	124	30
	130-145	130	Continuous
0	Over 266	-	0
	255-266	·	. 10
230	243-254	206	30
	217-242	217	Continuous
	Over 400	-	0
	381-400	-	· 10
345	363-380	311	. 30
	328-362	328	Continuous
	Over 600	-	0
	576-600	-	. 10
500	551-575	445	30
	475-550	475	Continuous

### **INSULATION LEVELS**

6. The equipment shall have the following:

Winding Insulation Class (kV)	Winding BIL (Fully Insulated) (kV)	Winding dc Test Voltage (kV)	Minimum Bushing BIL (kV)
5	75	19	75
8.7	95	26	95
15	110	34	110
25	150	50	150

EQUIPMENT STANDARDS			EI-4161, REV. 3 JANUARY, 1993
27	200	70	200
34.5	200	70	200
46	250	95	250
69	350	140	350
138	550	230	650
345	1050	460	1175

1993

Note: The aforementioned basic impulse insulation level (BIL) levels do not not apply to windings with graded insulation or wye-connected windings.

7. The basic impulse insulation level (BIL) rating of graded insulated windings shall be at least the same as that of the neutral bushing. The minimum insulation class shall be 15 kV, 110 kV BIL.

8. Transformers, phase angle regulators and shunt reactors shall be designed to withstand the routine dc proof test voltages specified above for five minutes. The unit is to be tested in the factory and the Company will apply the appropriate dc test voltage on each winding-to-ground for five minutes.

#### SHUNT REACTOR

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9. The shunt reactor shall have a saturation curve representing the characteristic magnetization of the core with the following minimum design requirements:

- Linear to 110 percent of the rated voltage
- Knee of curve at 120 percent of the rated voltage with a tolerance between 115 percent and 125 percent

#### SHORT CIRCUIT CAPABILITY

10. The transformers and phase angle regulators furnished to this specification shall be designed and constructed as to be capable of withstanding without damage the techanical and thermal stresses caused by normal short circuit duty imposed on the exterior terminals of the windings. The equipment shall be capable of sustaining terminal faults limited only by its own leakage impedance on the minimum impedance tap without damage.

11. Conformance to short circuit thermal requirements shall be by calculation in accordance with ANSI C57.12.90, latest revision.

12. Conformance to short circuit mechanical requirement shall be by submission of certified test data showing that the proposed design successfully passed the test specified in ANSI standards.

### ELECTRICAL CLEARANCES

13. The minimum phase-to-phase and phase-to-ground clearances (strike distances) of the bushings to metallic surfaces in air shall be as follows:

System	Minimum	Minimum
Phase-to-Phase	Phase-to-Phase	Phase-to-Ground
Nominal_Voltage	Strike_Distance	Strike_Distance
4.16 kV	7 inches	6 inches
13.8 kV	12 inches	7 inches
27 kV	18 inches	13 inches
· 34 kV	18 inches	13 inches
69 kV	30 inches	25 inches
138 kV	72 inches	60 inches
345 kV	132 inches	108 inches

## LOADING CAPABILITY

14. The transformer and all accessories shall be designed to meet or exceed the following Company requirements for emergency loading:

Percent of	65 Degrees C	Hours Overload per	Maximum Percent
Top Forced	Cooled Rated	24 hour Period	Acceptable Loss-of-
Load	(%)		Life
30 Degrees C	5 Degrees C	Assuming 100	
Ambient (Summer)	Ambient (Winter)	percent Prior Load	Per 24 hour period
120	140	24	0.25
127	147	. 24	0.50
143	161	3	1.0
169	191	1	1.0
180	200	0.33	1.0

#### SYSTEM CONDITIONS

15. The transformer shall be capable of operating continuously with 15 ampere of dc current flowing from the high voltage to low voltage windings or visa versa in an autotransformer or from the high voltage or low voltage winding to ground through the neutral connection for wye connected winding configuration. Operation of the transformer shall not be limited by factors such as stray flux, sound level, core saturation, etc.

## DETAIL REQUIREMENTS

#### GENERAL

16. No bare metallic current carrying parts in the transformer's tank is permitted. All busses, leads, connectors, conductors and associated details shall be taped and insulated using paper tape and/or tube to withstand rated voltage, including the neutral bus and leads.

17. All busses and cabling leads shall be supported off of support structures. Tieing of cable leads with linen tape to support structures is not acceptable.

18. No PVC, PCB, asbestos or lead material shall be used.

#### BUSHINGS

19. All bushings shall be of "extra creepage" design and ANSI Standard outdoor type. Bushings shall be chocolate brown, unless otherwise specified in Detail Specification -Part II.

20. The following bushings shall be used:

System	BIL	Current	ABB Style	Vert or
Voltage (kV)	(kV.)	(A)	Number	Horiz
500	1550	1600	550X1600UF	Vert
345	1175	2000	362X2000UJ	Vert
138	650	800	138X0800AA	Vert
		2000	138X2530AD	Vert
69	350	400/1200	069X0412AN	Vert
27	200	2000	034X2000BA	Vert
		2000	034U0200HB	Horiz
18.8/22	200	10000	034T1000HN	Both
13.8	110	3000	025X3000BF	Vert
		3000	025U0300HS	Horiz

EQUIPMENT
STANDARDS

		4000	025X4000UB	Vert
		4500	025U0450HP	Horiz
Neutral	110	400/1200	025X0412AT	Vert

21. Alternative bushing manufacturers will be considered only if all electrical characteristics and dimensional aspects are compatible. The bushing manufacturer, type and catalog number shall be submitted for approval.

22. All bushings for 138 kV or higher voltage windings shall be equipped with Type A normally grounded capacitance potential tap. The unit shall be suitable for possible future use with either a General Electric KA-108 or Westinghouse PBA-2 bushing potential device. On all other bushings, a test tap will be accepted if capacitance taps are not available.

23. All bushings shall be one piece porcelain or multi-piece joined by epoxy or glass welded. Gasketed joints are not acceptable.

24. All winding neutral connections shall be brought out through outdoor type bushings. The neutral bushing for the main windings shall be the same type and rating as the phase bushings, minimum 15 kV, 110 kV BIL.

24.1 The neutral bushing(s) shall be grounded to a 1/4 by 4-inch ground bus copper detail through a removable flexible connector. The copper bus detail shall be run and attached to one of the two ground pads on the base of the unit. A removable protective cover shall be furnished over the neutral bushing(s).

#### **CURRENT TRANSFORMERS**

25. The quantity, location and ratio of current transformer requirements shall be as indicated in in the Detail Specification - Part II.

26. The current transformers shall be manufactured and tested in accordance with ANSI C57.13.

27. Bushing type, multi-ratio, current transformers shall be provided and arranged so as to be accessible and removable from outside the transformer tank through top cover manholes. All secondary leads shall be brought out through a terminal board located on top of transformer tank. The current transformers shall not be internally grounded.

28. All current transformers shall be located on the top section of the core and coil assembly. Access to current transformers shall be such that Company personnel can perform polarity and ratio tests through the manholes without internal tank entry.

29. For each design of current transformer, the manufacturer shall submit to the Company for approval two certified copies of calculated (or typical) ratio correction curves and excitation curves. All of this information shall be furnished for each tap of the multi-ratio units.

29.1 Multi-ratio current transformer shall have a thermal rating factor of 1.5 and conform to the latest ANSI Standard C57.13, unless otherwise specified.

29.2 Accuracy class for relaying at standard burdens shall

CT Ratio

ANSI Accuracy Class

2000/5 (and higher)		C800
1200/5		C400
800/5	,	C200
600/5		C200
400/5		C100

29.3 The following standard tests shall be performed on the current transformers and certified test reports submitted to the Company for evaluation.

- Low frequency dielectric tests between windings and ground
- Induced potential tests
- Accuracy tests
- Polarity test
- Excitation current curve to 100 volts

#### DE-ENERGIZED TAP CHANGING EQUIPMENT

30. When this equipment is specified in the Detail Specification - Part II, it shall conform to the requirements specified below.

31. A de-energized tap changer shall be provided in the specified winding to give two 2.5 percent full capacity taps above and below the rated voltage.

32. The tap changer shall be externally operated and arranged for padlocking in each tap position.

33. The tap changer operating mechanism shall be mounted approximately 2 feet from the top cover of the transformer. The operating mechanism shall also be covered with a removable metal enclosure. The contacts shall be fully and easily accessible through manholes in the transformer top cover without untanking.

#### LOAD TAP CHANGING EQUIPMENT

34. When this equipment is specified in the Detail Specification - Part II, it shall conform to the requirements specified below. A tap changer manufactured by MagneTek Electric or Reinhausen is required.

35. The tap changing equipment will have a range of 12 percent buck to 12 percent boost in 32 steps (33 steps total) at the nominal rated voltage. Tap changer positions shall be labelled 16R to Neutral to 16L.

36. The transformer and tap changer shall be capable of operating continuously without overheating at maximum continuous system voltage with the no-load and load tap changer at minimum voltage tap position.

37. The low voltage winding(s) shall be capable of continuous operation at constant current. The current is the maximum current capability of the winding, regardless of the de-energized and automatic tap changer position, e.g., 2,732 A (65 MVA, 132-13.8 kV at 65 degrees C). In addition, the manufacturer must size the high voltage primary winding accordingly.

38. The transformer and tap changing equipment shall provide rated power (MVA) output at 0.8 power factor on all tap positions rated above the nominal rated voltage, when operating at the nominal rated voltage.

39. All the necessary tap changer equipment shall be mounted outside of the main transformer tank. The tap changer compartment shall be located no more than one foot below the top cover to minimize oil spillage should the tap changer barrier board and compartment doors rupture.

40. Oil communication between the transformer main tank and the tap changer compartments shall be prevented by the use of a barrier. The tap changer equipment (except vacuum type) shall have transfer switches housed in a compartment separated from the tap changer selector and reversing switches so that there will be no oil interchange between these switches. Arcing contacts in the selector compartment are not permitted.

41. The tap changer compartment(s) and barrier between the main tank and the selector must be able to withstand a pressure difference of 14.7 psi. In addition, all compartments

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(main tank(s), selector and diverter) shall be braced to withstand a full vacuum individually plus the head of oil in the main tank.

42. To facilitate the initial oil filling of the main tank and tap changer selector compartment, 1-inch minimum piping with a valve is required between the main tank and selector compartments. The valve will be closed during normal operation of the unit.

43. All contacts of the tap changer and associated equipment shall be readily accessible and designed to require minimum maintenance. Hinged doors on the side of the tank shall be provided for this purpose on the selector and transfer switch compartments. The maintenance periodicity shall be stated for evaluation.

44. Arcing contacts shall be made of arc resisting material suitable for long life. They shall be mechanically capable of performing over 50,000 operations at full load without inspection and over 200,000 operations without having to replace parts.

45. The terminal board connectors on the barrier board(s) separating the tap changer compartment and main tank and winding leads shall be stamped with the identification of the leads and terminal board connectors, respectively, that are to be connected to them.

46. To remove the diverter switch for inspection, a removable lifting device and a mounting provision shall be supplied on the top cover. The lifting device shall be stored and mounted in a suitable location on the main tank while not in use.

47. For vacuum and reactance type tap changers, support braces shall be provided under the selector and transfer switch compartment hinged doors to accept a Company supplied "cat-walk."

48. For purposes of inspection or repair, it shall be possible to operate the tap changers electrically when the transformer is de-energized and the oil removed from the tap changer diverter switch and selector switch compartments.

49. This equipment shall be capable of changing taps at any operating position with maximum loading on the transformer as permitted by the latest ANSI Standard C57.92 entitled "Guide for Loading of Oil Immersed Distribution and Power Transformers".

50. A tap changer operation counter shall be provided and located in the mechanism housing. The counter is to be mechanically driven, not electrically.

51. The LTC motor mechanism shall be mounted no more than 5 feet above ground level and be provided with a window for local observation of the tap changer position indicator.

52. The load tap changing mechanism shall be designed so that in the event it should bind or jam, the linkage shall not break between phases; the motor drive shall stall, and

the motor shall be positively protected from failure due to overheating. The use of shear pins, friction clutches and thermal protective devices as protective devices are not acceptable.

53. The shaft of the load tap changer mechanism which runs external to the tap changer and is mounted on the tank wall and cover shall be enclosed in a protective metal shroud.

### LOAD TAP CHANGER CONTROL

54. The Company will provide the voltage source for the automatic regulating control equipment. A current transformer for the compensators used for automatic regulation shall be provided by the transformer manufacturer.

54.1 The ratio of the current transformer will be specified in the Detail Specification - Part II.

54.2 The current circuits shall be designed for 0.2 ampere operation.

54.3 The automatic regulation control equipment shall be suitable for either 66 V or 115 V, 60 hz input voltage from potential transformers.

54.4 The voltage regulator shall have an operating range of 100 to 135 V, ac.

55. The automatic tap changing equipment shall be suitable for stable operation without hunting when operating in parallel with other transformers. Parallel control of the tap changers shall be performed by the circulating current method.

56. The operating mechanism shall be designed to provide at the transformer, electrical operation (with the transformer carrying load) and manual operation (with the transformer de-energized); and it shall be designed so that it shall be impossible to operate the tap changer electrically during such manual operation. It shall also be impossible to operate the tap changers remotely during local operation.

57. A Selsyn, or equivalent, electrical transmitting, receiving and indicating equipment shall be provided for remote indication of the tap changer position. The indicating units shall be a nominal 4-1/2 inch in diameter and will be mounted by others on the Company's control board. In addition, a Selsyn or equivalent receiver position indicator shall be provided at the electrical control location in the main control cabinet of the transformer for indication. A mechanical position indicator shall be provided at the motor drive mechanism.

58. Lights shall be provided in the LTC control housing to provide the following indications:

58.1 When passing from one tap to the adjacent tap.

58.2 When reaching each limit position.

58.3 When the tap changer is operated on local-automatic control.

58.4 When the tap changer is operated on remote control.

59. Provision shall be made for the remote indication of the aforementioned events by means of lamps to be furnished by others.

60. The LTC equipment shall be furnished with interposing relays for supervisory control of LTC equipment and individual 40 ohm tapped precision resistors for telemetering of LTC position to a remote location. The devices shall be wired to terminal blocks in the tap changer compartment.

61. The manufacturer shall supply a lockout relay to prevent paralleled tap changers from runaway conditions.

62. An adjustable device shall be provided suitable for obtaining a time delay in the range from 15 to 60 seconds during automatic operation in both raise and lower directions between successive tap changes as well as to the initial step of a tap change. Unless otherwise specified, this device shall be set for 60 seconds.

63. The manufacturer shall furnish the necessary auxiliary relays in the tap changer control circuit to provide for 3, 5 and 8 percent voltage reduction. The auxiliary relays shall have sufficient contacts to provide for supervisory indication and for by-passing the time delay relays. The exact scheme is given on attached Company Drawing No. B167934.

64. The LTC equipment shall be arranged so that in the event power is lost during tap change operation, the LTC shall go the back to the tap position before the power loss or the next lower tap position.

65. Provision shall be made for the de-energization of the automatic LTC control circuit by means of an auxiliary circuit breaker contact to be furnished by others. Refer to Company Drawing No. B167934 for the preferred arrangement. A "Local/Remote" control switch and "Raise" and "Lower" push button switches are to be located in the tap changer motor drive control cabinet.

66. The separate "individual-parallel" operation switch for parallel operation of the LTC equipment shall be mounted on the front panel of the control cabinet and shall be identified as follows:

### On Parallel Operation - Off Parallel Operation or Parallel Operation On - Off

67. An additional switch shall be provided marked "Manual-Automatic".

68. The tap changer motor drive control cabinets shall be mounted no more than 5 feet above ground level for field access to all areas of the cabinets, while the transformer is energized.

### AUXILIARY POWER SUPPLY

69. The Company will provide two separate 120/208 volt, 60 hertz, 3-phase, 4-wire grounded wye-neutral supplies, one for normal use and one for emergency use.

70. The two 120/208 volt, 60 hertz, 3 phase, 4 wire wye grounded-neutral sources of power are for operation of the cooling equipment, tap changer and auxiliary equipment.

71. An ASCO mechanically latched, automatic transfer switch, Type 940, or equivalent approved by the Company shall be provided inside the control cabinet. See Con Edison Drawing No. B167935, attached, for a typical schematic. It shall be equipped with local signal lights indicating transfer switch position, and auxiliary contacts for annunciator alarm indication when the switch is connected to the emergency power supply and when it is returned automatically to the normal position.

72. One 125 volt dc ungrounded source of power is provided for operation of alarms and controls. For phase angle regulators and shunt reactors, a second 125 volt dc ungrounded source of power is provided for operation of the fault pressure relay which is be used to trip the equipment.

#### WIRING

73. All electrical control circuits shall be copper stranded wire with a minimum 600 volt Class insulation having oil resistant insulation and flame resistant finish. The wire insulation shall be solid, continuous sheath, flame resistant, cross-linked polyethylene (SIS). General Electric Company Type XhhW rate VW-1, SIS 8768 Vulkene gas and oil resistant or Dupont Tefzel insulated, Type XTF rated 600 volt, 300 degrees F wire may be used.

73.1 All electrical control circuit wiring shall be a minimum No. 14 AWG.

73.2 The current transformer secondary wiring shall be a minimum No. 12 AWG.

74. Splicing of current transformer pigtail wiring and wiring to main control cabinet is not permitted. A junction box with terminal blocks shall be used.

75. Single conductor wires shall be used on all power circuits. The paralleling of several equivalent smaller wires in place of a single wire is not acceptable.

76. All control wiring shall be supplied with ring-type insulated terminals as per Plate No. 3008-2, Attachment No. 1.

77. All relays and other wiring devices shall have engraved plastic nameplates as per Company Drawing No. B190950. The nameplates shall indicate the device designation and functional description of the device's use, e.g., cooling equipment breaker. Nameplates are to be secured by screws. Adhesive on the back of the nameplates is unacceptable.

78. Terminal block arrangement and internal connections shall be in accordance with Company Drawing No. A239621 or A239576. The manufacturer shall mount and wire to his terminal blocks for Con Edison's external connections as shown.

79. All external wiring shall be enclosed in rigid metal conduit.

80. All wiring, e.g., current transformer wiring, located internal to the transformer tank shall be bundled and enclosed in rigid tubing of non-metallic type and oil resistant provided with non-screw type fasteners to the bottom of the top cover. Tie wrapping of the wiring supported off the tank cover is not acceptable.

81. Terminal blocks for relays, current transformers, and the Company's external control connections shall be provided and shall be States Company, Catalog No. ZWM 2500 sliding link type, with marking strips and no covers or P & S Type G with Melamine barriers and marking strips, selected to provide not less than 10 percent spare terminal positions on each block. The power terminal blocks shall be Square D Co. Class 9080,

Type GE-6, 4 point terminal, for 4/0 cable or equivalent. No terminal blocks, relays, etc., is to mounted on a swing panel.

82. Power circuit wiring and control wiring shall not be run through a common conduit and terminal blocks. Separate terminal blocks and conduit shall be provided for power circuits. This also includes the wiring troughs used in control cabinets.

83. All interconnecting power and control wiring to accessories, e.g., gauges, cooling pumps, fans, and between terminal or junction boxes from the main control cabinets shall be made by means of plug connectors approved by the Company. The manufacturer shall supply 10 percent extra connecting plugs and any special tools needed to insert and remove wire connections to these plugs.

84. All electrical connections from devices inside the main transformer tank shall be brought out through the top tank cover in oil-tight connections to test links enclosed in a watertight box having a removable cover, unless otherwise specified in Detail Specification - Part II.

#### **CONTROL CABINETS**

85. Control cabinets shall be NEMA Type 3R hinged door enclosures with a lockable handle. Vents in the top and bottom of the cabinets are required.

86. The control cabinets shall be mounted no more than 5 feet above ground level for field access to all areas of the cabinets.

87. The bottom of the control cabinet shall have an undrilled removable plate. No valves, piping or other accessories shall be located underneath this plate. This area is reserved for Company control and power cable conduits entry.

88. A minimum clearance of 12-inches is required between the bottom of the terminal blocks and the bottom of the control cabinet.

89. Mounting of relays, space heaters and terminal blocks on the door of the control cabinet or swing panels is unacceptable.

90. Thermostatically controlled space heaters shall be provided in all control compartments. A control switch shall be provided to operate the space heaters in either thermostatic or manual control mode. The heaters shall be provided with guards for the protection of personnel.

91. An internal switch operated light and working receptacle shall be provided in each control compartment. In addition, heaters are not to be located cable wiring areas.

92. All compartment doors for control cabinet shall be arranged for padlocking. Separate boltable dog clips are not required.

## TANK CONSTRUCTION

93. The transformer may be utilized to replace existing transformers throughout the Company's system. Therefore, the manufacturer shall design the transformer based on the dimensional constraints and general arrangement drawings stated in Detail Specification - Part II.

94. The transformer, phase angle regulator and shunt reactor main tank and auxiliary compartments shall be fabricated of steel, oil tight and of welded construction. The top shall be welded, not bolted to the tank. If a load tap changer is required, all compartment shall be welded to the tank. All compartments shall be designed to withstand full vacuum.

95. The welded tank construction shall be designed and fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. In addition, where required, the equipment shall be stress relieved as a complete unit prior to final machining.

96. The interior of the main tank shall be painted with a non-hydroscopic white paint. Manufacturer shall ensure that the paint is non-toxic and compatible with long-term exposure to high temperature oil. In addition, the paint is not to deteriorate with temperature and release combustible gases.

97. Two 24-inch diameter manhole openings, gasketed and boltable, are required on the top cover of the transformer, located on diametrically opposite corners of the tank.

98. In addition, a oval manhole on the sidewall of the selector compartment is required. The manholes will be used by the Company to perform internal inspections of the complete transformer in the field. Where this is not feasible, the manufacturer shall list this as an exception to the specification. Bolted manholes located on the sidewall of the transformer tank may be acceptable when they are designed for welding as per Attachment No. 2.

99. No lead support structures or accessories shall limit entry into the unit for internal inspections.

100. The internal arrangement of the core and coil assembly shall permit personnel entry in the transformer for visual inspection of the complete core and coil assembly, series transformer, lead structure, etc.

101. All flanges, valve fittings, access openings, and accessories which are located on the main tank below the oil level shall be designed for and welded or brazed in the factory in accordance with Attachment No. 2.

102. Bushing pockets located on the sidewall of the tank for mounting of bushings are not acceptable.

103. Inspection manholes on the sidewall of the tank and LTC compartment shall be of bolted design suitable for welding in accordance with Attachment No. 2. The Company 104. will field weld an oil seal over the pockets to the tank flange. The manufacturer shall supply oil seal covers for field welding. This access opening sealing procedure does not apply to the LTC compartment hinged doors.

105. If the main tank has a shipping split, the permanent cover shall be designed to be bolted to the main tank using recessed gasket. A 1/4 inch steel enclosure shall be provided for field welding around the bolted cover to provide a positive oil seal (See Attachment No. 3 for details).

106. The base of the main tank shall be designed for installation on a flat foundation. In addition, the base is to designed to support the weight of the unit completely assembled including oil and capable of being moved by lifting and skidding.

#### JACKING AND LIFTING FACILITIES

107. To facilitate lifting and setting the main tank on the foundation, the following points shall be permanently marked on the main tank:

- Center of gravity point without oil.
- Center point of width, height and length.

108. The base of the main tank shall be provided with skid plates to permit movement in the horizontal direction. Lifting eyes and hooks shall have a minimum I.D. of  $4 \frac{1}{2}$  inches.

109. Main tanks with a shipping weight not exceeding 250,000 pounds and compartments that exceed 1,000 cubic feet shall have jacking pads protruding not more that 12 inches from the tank wall, have a minimum jacking contact surface of 10 inches by 10 inches and located approximately, but not less than, 16 inches above the base of the transformer. Pulling eyes shall have a minimum I.D. of 3 1/2 inches.

110. Main tanks and compartments with a shipping weight in excess of 250,000 pounds shall have jacking pad protruding 14 inches from the tank wall having a minimum horizontal contact surface of 12 inches by 12 inches. The pads should be located no less than 26 inches above the tank base. Pulling eyes shall have a minimum I.D. of 4 1/2 inches.

111. Steel brackets, minimum of 5 inches by 5 inches by 2 inches thick, shall be furnished, near the top cover and corners of the main tank, protruding horizontally and have one hole, centered, with a minimum I.D. of 1 1/4 inches for attachment of tie-rods for shipment.

## PHASE ANGLE REGULATING TRANSFORMER

112. A single tank to house the series and exciting transformer is preferable. If the shipping limitations can not be met with a single tank design, a two tank design consisting of a series transformer and an exciting transformer connected via throats is acceptable.

113. The throat design between the series and exciting transformers shall be three individual phase isolated throats with insulating panels between the series and exciting unit throats. An oil level gauge shall be provided on each throat. The manufacturer shall describe in detail the following information with regard to the throats:

114. Support details inside the throat and termination details at the series and exciting transformer wall feeding the throats.

- Indicate bus or cable in the throat.
- State the material and design of the throat panels.
- The throat will be a bolted design with provisions for a welded oil seal around the bolt flange.
- Methodology to compensate for oil expansion in throats.

115. The manufacturer shall describe in detail the throat and support scheme of the LTC leads between the two transformers.

### SAFETY RAILS

116. For the purpose of providing safety to personnel working on the main tank, safety rail plates shall be welded on the top cover of the main tank. Company supplied safety railing will be installed when personnel work on the top cover.

116.1 The plates shall have two pipe sections spaced 4 inches apart between pipe centers.

116.2 On each end of the plate, a channel capable of accepting a 2 inch wide kick plate shall be provided. The length of the channel shall be 4 inches.

116.3 Pipe section shall have a length of 8 inches with 1 3/4 inch I.D.

116.4 The pipe shall have a hole drilled at the bottom for drainage of water.

116.5 Plates shall be welded along the perimeter for 5 foot length safety rails.

116.6 On transformer with double wall construction, the above pipes will be placed on the outer wall.

# GASKETS, FITTINGS AND FLANGES

117. All flanges, valve fittings, compartments and accessories which are removed for shipment or are to be installed in the field shall have bolted connections using recessed retained type reusable gaskets made of viton or nitrille rubber.

118. All generator step-up transformer primary bushing gaskets shall be viton rubber. Gaskets consisting of cork material are not acceptable.

119. All doors, inspection, manhole and handhole covers shall be gasketed with recessed retained type, reusable gaskets using bolted type construction.

120. All openings on the sidewall of the main tank(s) shall be designed for welding in accordance with Attachment No. 2 and the Company will field weld these covers to the tank. The manufacturer shall supply the covers for field welding.

121. One 4-inch diameter nipple welded to each main tank top cover and located on the diametrically opposite corner of each main tank fill valve is required. This fitting will be utilized to evacuate the transformer through a 4-inch diameter valve supplied by the Company. When evacuation is complete, the 4-inch diameter valve will be removed and a permanent cap will be installed. The manufacturer shall supply the 4-inch diameter cap to fit the nipple. This fitting shall be clearly identified using an oil resistant engraved identification tag as "VACUUM CONNECTION".

122. On phase angle regulators, a 2-inch diameter nipple welded on each throat connecting the exciter and series transformer together shall be provided.

123. One 3/8-inch diameter tee fitting shall be provided on the tank cover. The fitting shall be located in-line and on the same side of the tank as the oil sampling valve. This fitting will be utilized to connect to a tygon tube from the oil sampling valve for oil level indication during oil filling and to attach a vacuum gauge during evacuation. This fitting shall be clearly identified using an oil resistant engraved identification tag as

# "VACUUM GAUGE AND TYGON TUBE CONNECTIONS".

#### VALVES

124. All valves shall be gate, globe or full port ball type. Butterfly or flapper type valves are unacceptable.

125. One 2-inch diameter drain valve is required for each main tank.

126. One 1-inch diameter drain valve is required for each accessory compartment, including tap changer selector compartment and throats on phase angle regulators connecting the exciter and series transformer together.

127. One 2-inch diameter fill valve is required for each main tank. The fill valve shall be located at ground level at one corner on the external side of the tank. The manufacturer shall then supply piping (with a 2-inch diameter) on the internal side of the tank sidewall and top cover such that oil entering the fill valve at ground level is channeled through the internal piping to above the core yoke structure. Holes shall be drilled in the piping so as to spray or "splash" oil onto the windings.

128. One 1-inch diameter fill valve is required for each each accessory compartment, including tap changer selector compartment and throats on phase angle regulators connecting the exciter and series transformer together.

129. One 1-inch diameter valve with piping is required between the top of the LTC selector compartment to the main tank. During dryout and oil filling of the unit, the valve will be opened to facilitate pulling vacuum on the selector switch compartment. Subsequently, the valve will be closed for normal operation of the transformer.
130. One oil sampling valve for each main tank and each oil filled compartment is required with the exception of the LTC contactor compartment. Swagelok Quick-Connects, SS-QC4-S-4HC and SS-QC4-B-4PM, shall be supplied on each oil sampling valve. Stainless steel 1/4 inch ID tubing shall also be supplied between the sampling valves and Swagelok Quick-Connects such that no personnel entry is required within sound enclosures.

131. All sampling valves shall be brought to one centrally located point and be accessible from ground level.

132. One 1-inch diameter value is required on the top and bottom of each radiator bank header assembly.

133. All the above mentioned valves shall be clearly identified using oil resistant engraved nameplates as follows:

- Oil Fill Valve Main Tank
- Oil Fill Valve Series and Exciting Tank (Phase Angle Regulator)
- Oil Fill Valve Selector Compartment
- Oil Fill Valve Diverter Switch
- Oil Fill Valve Throat
- Oil Drain Valve Main Tank
- Oil Drain Valve Series and Exciting Tank (Phase Angle Regulator)
- Oil Drain Valve Selector Compartment
- Oil Drain Valve Diverter Switch
- Oil Drain Valve Throat
- Oil Sampling Valve Main Tank
- Oil Sampling Valve Series, Exciting Tank (Phase Angle Regulator)
- Oil Sampling Valve Selector Compartment
- Oil Sampling Valve Throat
- Gas Collection Relay

134. Upper and lower shutoff valves which isolate each radiator bank from the main tank(s) are required. These valves shall be located on and welded to the main tank(s).

135. If the transformer is equipped with cooling pumps, shut-off valves are required on both the suction and discharge sides of each pump to facilitate the pump replacement without draining oil. Bleeder vents are required on oil piping and on each pump to provide for draining and oil filling.

136. One 1/2-inch diameter drain value is required on each cooling pump to facilitate replacement of the pump.

## OIL PRESERVATION SYSTEMS

## 137. Inert-Gas Pressure Type System

137.1 Automatic inert-gas pressure equipment with alarm contacts for high pressure, low pressure and empty cylinder alarms shall be provided. The gas control cabinet shall have a full length enclosure with provisions to retain the gas bottles and be open at the bottom to permit installation of the gas bottle at ground level.

137.2 The cabinet shall also have provisions for a second gas bottle which can be rolled into the cabinet without lifting.

137.3 The gas piping and associated valves shall be arranged so that each gassealed compartment may be separately filled and sampled from diagonally opposite corners. No valves shall be installed in the gas lines between the entrance to the main tank and the pressure switch for the low gas pressure alarm.

## 138. Conservator Type Systems

138.1 Conservator type systems shall have no direct contact between the ambient atmosphere and oil. The conservator for the main tank shall utilize a bag and a silica gel breather. The tap changer diverter switch and selector switch compartments shall have separate conservator tanks or compartments with no common oil. Each conservator compartment shall have a silica gel breather.

138.2 The conservator shall be placed such that maximum operating oil level shall be no higher than the top of the cover mounted bushing adapters. If the manufacturer must mount the conservator above the height of the bushing adapters, an ELIN check valve between the main and conservator tanks is to be installed. Isolation valves shall be installed on both sides of the ELIN valve to facilitate replacement. An ELIN valve shall also be provided for the tap changer selector compartment connection to the conservator. The top of the radiator bank shall always be below the top of the cover mounted bushing adapters.

138.3 A Qualitrol gas accumulation relay, Bulletin QT2-038, that indicates the cubic centimeters of gas accumulation shall be provided. The device shall be mounted so that the accumulation gauge can be read and piping with valve provided so that the collected gas can be sampled from ground level.

138.4 A Qualitrol liquid level gauge is required for each conservator or conservator compartments. The device shall be mounted pointing downward at an angle such that the gauge can be read directly underneath the gauge. In addition,

Qualitrol Remote Reading Liquid Level Monitor, 039-Series shall be provided with each liquid level gauge; mounted adjacent to the main control cabinet(s).

### COOLING REQUIREMENTS

139. Forced-cooling equipment shall be grouped electrically in not less than 2-groups per stage of cooling so that loss of any group will cause a negligible reduction in forced-cooling effect. Each group is to have individual motor contactor and breaker protection.

140. Triple rated transformers employing both pumps and fans, shall have the first stage of forced cooling consist of all pumps and a minimum number of fans to obtain the 133 percent rating. The second stage of forced cooling shall consist of the addition of fans only to obtain the 167 percent rating.

141. Automatic control equipment shall be provided for starting and stopping control for each stage of cooling.

142. The motors for the cooling equipment shall be three phase, 60 hz suitable for operation on a 208 volt plus/minus 10 percent system. All fans shall be equipped with guards having not more than 1/2-inch spacing in accordance with OSHA requirements. All fans shall be designed for outdoor use.

143. Cooling pumps shall be manufactured by Cardinal and J. W. Harley design. In addition, TecSonics bearing wear monitoring system shall be provided with each pump.

144. Provision shall be made for <u>only</u> de-energization of all cooling pumps upon deenergization of the transformer or phase angle regulator. The stopping of the cooling pumps is done to limit the assimilation of material throughout the transformer as the result of a fault or cooling pump failure, and limit oil spillage and fire spreading for a tank rupture. Cooling pumps will be turned on again, as required by loading, when the transformer is re-energized. Cooling fans shall continue to run and be controlled by the winding temperature, independent of cooling pump operation. The cooling pumps are to controlled by a "voltage present" detection relay, GE, Model No. 12HGA17A63 or equivalent. The relay will be connected to a potential transformers (connected phase-tophase), supplied by the Company. The pick-up of the relay shall be 48 volts (40 percent of the rated voltage, 120 V). The relay will pick-up with one-phase of the potential source out-of-service, e.g., blown fuse.

145. Cooling pumps shall be located on the lower portion of the cooler piping to facilitate maintenance and reduce outage time. Cooling pumps which have motors in-line with the normal oil flow are not acceptable. One oil flow indicator, manufactured by Qualitrol shall be installed in the oil line adjacent to each cooling pump. Alarm contacts shall be provided which will indicate failure of the oil pumps to operate when the cooling

equipment is energized. A time delay relay shall be provided to prevent unnecessary operation of the alarm during pump starting.

146. Radiators shall be free-standing and factory assembled in banks with all radiators of a bank welded to a common header.

147. All horizontal section of radiator piping shall have a vent plug on the top of each pipe section.

148. The radiator banks shall be provided with vent plugs on the high points of each radiator bank header and 1-inch valve on the top and bottom header pipe.

149. The radiator cooling piping flanges shall be designed for bolting to the transformer main tank.

150. Fans shall be factory mounted on the radiators with all wiring terminated in a control cabinet on the base of the radiator bank.

151. All misalignment or compensating piping used on the transformer shall be bellows type made of stainless steel. Dresser couplings are not acceptable.

## ACCESSORIES

152. Standard accessories shall be furnished, such as winding and liquid temperature indicators with alarm contacts, winding temperature equipment to control the operation of forced-cooling equipment, magnetic oil-level indicators for all oil-filled compartments with low-level and high-level alarm contacts and, oil flow gauges with alarm contacts to indicate correct cooling pump operation.

153. All gauges and indicator faceplates shall be made of "Plexiglass" and equipped with protective screening. Glass faceplate is unacceptable.

154. The leads from all gauges shall be run to the main control cabinet in rigid metal conduit and be appropriately terminated. A short section of flexible Anaconda Seal-Tight conduit, maximum one foot, can be used on the device end.

155. Liquid Level Gauge

155.1 Oil liquid level gauge, manufactured by Qualitrol, is required for each oil filled compartment. A float type oil level gauge with alarm contacts for low and high oil level is required wired to the transformer annunciator.

155.2 For conservator preservation type system, a Qualitrol liquid level gauge is to be installed on each compartment of the conservator, i.e., main tank, selector compartment and diverter switch compartment. Since the conservator tank can be located above the radiators, reading of the gauge from ground level may not be practical. Therefore, remote reading Qualitrol Remote Reading Liquid Level Monitors, Type 039-Series are to be mounted adjacent to the main control cabinet.

155.3 All liquid level gauges shall be mounted such that the gauge is easily visible from ground level. Otherwise, the aforementioned remote reading liquid level monitor shall be provided.

155.4 On phase angle regulators using throats to connect the exciter and series transformer tanks together, each throat is to have a liquid level gauge.

156. <u>Temperature Gauge</u>

156.1 The liquid and winding temperature gauges shall be manufactured by Qualitrol. Temperature indicator scales shall go to 200 degrees C for winding and to 120 degrees C for liquid indication.

156.2 Separate sealed dry wells shall be provided for all temperature thermometers.

156.3 All temperature gauges shall be mounted adjacent to the main control cabinet(s).

156.4 The temperature gauges shall be set to alarm for the following temperature levels:

Temperature Gauge

Alarm Setting (Degrees C)

Liquid (Top-Oil)

High 90
High/High 115

Winding (Hot-Spot)

٠	High	110
٠	High/High	135

156.5 The manufacturer is to provide winding temperature gauge calibration data for field checking of the gauge, temperature detector and auxiliary current transformer. This should include a sufficient number of heater coil current and corresponding temperature rise values to permit checking the instrument under varies top oil temperature conditions.

## 157. Fault Pressure Relay

157.1 The pressure relay shall be supplied with the Qualitrol, Inc., Series 909 seal-in relay suitable for 125 v dc operation. The seal-in relay shall be provided with the provision for automatic resetting by a remote contact supplied by the Company.

157.2 At least one fault or sudden pressure relay should be mounted on each main tank. In addition, there shall be one fault or sudden pressure relay on each LTC selector compartment, where applicable. These relays shall be located so as to be insensitive to the effects of cooler pump start-up and energization. The relay(s) shall be a Qualitrol Inc. Type 900-1 for flange mounting.

157.3 An isolation gate valve, e.g., Qualitrol, with flanges shall be provided between the tank and sudden pressure relay to facilitate testing and replacement of the relay.

157.4 For power transformers, the relays shall be wired for alarm purposes only to the annunciator.

157.5 For phase angle regulating transformers and shunt reactors the relays shall be wired for both alarm at the transformer annunciator and Company trip purposes.

158. Pressure Relief Device

158.1 The pressure relief device shall be manufactured by Qualitrol with a mechanical long arm semaphore for visual indication of operation and alarm contacts.

158.2 Pressure relief device(s) shall be provided for each compartment. There shall be one pressure relief device for each 7500 gallons of oil or part thereof. Multiple pressure relief device alarm contacts on the same compartment are to be paralleled into a single annunciator alarm point. This device should reseal after the over pressure has been relieved.

158.3 If the design requires bushing adapters and a conservator type oil preservation system is used, then the relief device(s) for the main tank, throats and selector compartment shall be mounted no lower than highest point of the bushing adapter.

158.4 Pressure relief device shall be provided on each diverter switch compartment. "Blowout patch" or pressure relief diaphragm is not acceptable.

158.5 When more than one pressure relief device is required on the main tank, tap changer compartments and throats the alarm contacts may be wired in parallel to one annunciator alarm point for each oil compartment involved. However, there must be a separate alarm for each compartment and a separate annunciator point.

159. Combustible Gas Monitor

159.1 A combustible gas monitor, e.g., Hydran 201 Incipient Fault Monitor, is to be mounted on the main tank at ground level to continuously monitor the gas concentration in the oil. The monitor shall be provided with two alarm contacts, one set connected to alarm on the annunciator.

160. Direct Winding Temperature Measurement

160.1 The hot-spot temperature of the main windings under normal and emergency operating conditions is to be measured and monitored using the Luxtron hot-spot detector. A fiber-optic temperature probe is to be embedded in the winding located where the temperature is the highest. In addition, a probe is to be located to measure the hottest oil temperature in a winding cooling duct.

160.2 For redundancy, two temperature probes are to be mounted for each application and brought out of the main tank through the pod.

160.3 The manufacturer is to submit data showing that the probes are located in the hottest point of the winding and oil.

160.4 The sensor probe and accessories located in the main tank are to be free of metallic parts and compatible with winding hot-spot temperature (200 degrees C).

160.5 Fiber-optic cable is to be protected in a rigid insulating tube and routed on the bottom of the top cover to the tank wall penetration.

160.6 The fiber-optic cables are to be brought out of the main tank through an oil-tight pod similar to that use for current transformers. The cables shall then be run to the main control cabinet and terminated for diagnostic monitoring by Company's temperature measurement instrumentation. If a separate control cabinet is supplied, the cabinet shall have a 120-volt 1-phase outlet, space heater and light.

160.7 Manufacturer is to submit a detailed description of the temperature probe and instrumentation to be used and experience list. Data is to be provided to demonstrate that failure of the probe and/or fiber-optic cable does not jeopardize the dielectric integrity of the unit.

#### 161. Annunciator

161.1 A local annunciator board manufactured by Seekirk, Inc. or Rochester shall be provided in the control cabinet. The control cabinet shall be provided with a window for local observation of the alarm indication lights, acknowledgment and maintenance at ground level.

161.2 The annunciators are to be accessible from the front for ease of field wiring and module replacement. The entire front panel is to be hinged swing type construction.

161.3 The annunciator shall be supplied with enough points to indicate a problem with the following items:

- loss of cooling supply
- loss of oil flow
- high liquid level
- low liquid level
- pressure relief device
- sudden pressure relay
- gas detector relay

• combustible gas

- high liquid temperature
- high/high liquid temperature

• high winding temperature

- high/high winding temperature
- high liquid level (diverter comp. and selector comp.)
- low liquid level (diverter comp. and selector comp.)
- pressure relief device (diverter comp. and selector comp.)
- sudden pressure relay selector comp.

ac normal/emergency supply trouble

auto regulation

local control

• tap changer hang-up

- tap changer limit
- tap changer out-of-step
- tap changer loss-of-vacuum (if applicable)
- percent voltage reduction
- excessive oil flow conservator tank (ELIN valve)
- low nitrogen cylinder pressure

161.4 There shall be one alarm indication for each sensing device. Also, the annunciator shall alarm independently for alarms that are wired to the control room.

161.5 The annunciator system shall be designed to provide remote Company's alarm indication with normally open and normally closed contacts. Provisions shall be made so that any contact can be "field changed" from normally open to normally closed and vice-versa.

161.6 The annunciator system shall be provided with a "reflash feature" which permits acknowledgment of an alarm and permits resetting of the Company's remote alarm without affecting the local alarmed point on the annunciator. Upon the initiation of another alarm point, the Company's remote alarm shall be re-activated. The annunciator alarms shall only be cleared upon removal of the alarm condition.

161.7 The annunciator shall be designed so that no damage will occur if the input dc supply leads are inadvertently reversed.

161.8 Transients, noise, induced voltages and variations in dc supply voltage of +/- 10 percent shall not cause any alarms to operate.

161.9 When legend plates are provided for alarm description, they are to be laminated vinyl with black lettering against a white background, back engraved. The plates are to be secured by screws or studs. Pressure sensitive adhesive plates are unacceptable.

#### MISCELLANEOUS

#### 162. Core Ground

162.1 Core ground connection(s) shall be accessible for testing from outside of the equipment without the necessity of removing any manholes on the top cover. The core grounds shall be brought out of the top cover of the tank through a CT type pod and terminated in a box, then grounded with a removable external strap. Personnel entry in the tank is not acceptable in conducting the test. Separate core grounds shall be provided for main and series transformer cores. Manufacturer shall state in the proposal the method of core grounding used.

#### 163. Surge Arresters

163.1 Provisions for mounting surge arresters shall be supplied for the required bushing terminals and shall conform to the requirements specified below unless otherwise specified in the Detail Specification Part II.

163.2 The arrester mounting brackets shall be spaced to provide the clearance required from phase-to-phase and phase-to-ground.

163.3 A minimum of one NEMA ground pad shall be located on the top of the main tank for each arrester mounting bracket. The manufacturer shall also provide the necessary ground bus of at least 0.5 square inch cross section of copper between the above mentioned tank ground pads and the ground pads located at the bottom of the tank.

## 164. Bushing Potential Devices

164.1 When this equipment is specified in the Detail Specification Part II, Class A devices will be provided, either a General Electric KA-108 or Westinghouse PBA-2 bushing potential devices.

164.2 The main tank shall include provisions to mount the bushing potential devices on either lengthwise side of the tank. The bushing potential devices will be installed on the side opposite the radiator banks. These provisions shall include device support brackets, and the secondary wiring and conduits required between the devices and the control cabinet. The bushing potential lead length shall be suitable for both mounting positions of the devices.

#### 165. Grounding

165.1 Two 4-inch by 4-inch flat finished copper or stainless steel surfaces shall be furnished on diagonally opposite sides of the transformer tank near the bottom for the connection of the Company's ground cables. These surfaces shall be drilled for 4 symmetrically placed 1/2 inch-bolts.

165.2 The transformer manufacturer shall furnish the necessary ground bus of at least 1.0 square inch cross section of copper or equivalent, between this flat surface and the neutral bushing, external neutral reactor and surge arrester ground pads if this equipment is furnished as part of the transformer.

165.3 The manufacturer shall also provide the necessary ground bus of at least 0.5 square inch cross section of copper or equivalent between the above mentioned tank ground pads and bushing potential device and external reactor

housing if the same are provided or if provisions to mount these devices are required with the transformer.

#### 166. <u>Nameplate</u>

166.1 The nameplate shall include the following information. In addition, to the information required by ANSI standards:

- Manufacturer and type of load tap changer, if applicable
- Main tank shipping weight without oil and oil-filled
- Radiator weight without oil and oil-filled
- Oil volume in main tank, selector and diverter switch
- compartments, and radiators
- Current transformer ratio at all taps
- and accuracy classification
- Maximum Sound level
- Year of manufacture

166.2 The nameplate shall also indicate the oil level in the main tank, conservator and all compartments, if applicable, from the top cover flange. This data is required to "dip stick" measure the unit to verify the oil level gauge accuracy. The change in oil level will be indicated per 10 degrees C change in liquid temperature.

166.3 Each bushing shall have a nameplate indicating the manufacturer, type, catalog number, and rating including its capacitance values and power factor.

# SOUND ENCLOSURE REQUIREMENTS

#### GENERAL

167. Since these transformers may be installed in a residential area, it is important that the noise level of the transformer, load tap changer, cooling equipment and all other accessories be maintained at a minimum. The sound level limits will be given in the Detail Specification - Part II.

### CONSTRUCTION

168. The sound enclosure shall be of bolted steel construction, supported off of the main tank and completely watertight. If the enclosure is self-supporting, the structural steel framework will be bolted to the foundation using 5/8 inch by 3-inch, maximum, anchor bolts. On-site welding will not be permitted.

169. Sound deadening material shall be treated to be water-resistant and shall be fully contained within a metal enclosure. The metal enclosure shall have a panel with a minimum thickness of 1/8 inch.

170. All horizontal sections will be sloped to shed water. The sound enclosure shall have a roof section with vents. Access openings over manholes, core ground points, and LTC diverter switch are required. The roof shall have a structural design and non-skid platform, which permits six man work crews, and vacuum handling equipment, including a 1000-pound cold trap to be supported.

171. Scuppers to permit water drainage shall be located at a maximum of 1/2 inch above the pad surfaces. The scuppers will be of sufficient size and number to drain any fluid that might be discharged.

172. Access to the control cabinet doors will be through a hinged access door in the enclosure. The door shall latch in the full open position. This door will be complete with a heavy-duty latch, rubber gaskets and safety glass window through which all gauges will be visible without entry into the enclosure.

173. Bolt on access covers shall be provided for all valves, manholes and outlet boxes.

174. The sound enclosure may be shipped attached to the main tank if it is braced for railroad transport. Lifting lugs, pulling eyes, and jacking pads must have full access, and the base of the sound panels must be raised with respect to the main tank base such that the transformers can be skidded without damage to the sound panels.

175. The sound enclosure shall be completely assembled on the equipment on the factory floor and tested prior to shipment. A technical description of the sound enclosure shall be provided with the proposal.

176. The manufacturer shall supply detailed sound enclosure drawings for approval by the Company prior to an order being placed.

# INTERNAL WATER DELUGE FIRE PROTECTION SYSTEM

177. The manufacturer shall provide a water deluge fire protection system for equipment using a self-supporting sound enclosure where there is more than six inches between the main tank and the sound panels. The fire protection system required inside the enclosure shall meet all requirements detailed in the City of New York Building Code, National

Fire Protection Association (NFPA), National Fire Code and National Board of Fire Underwriters.

178. Manufacturers shall supply all piping, fittings, valves, pipe supports, hangers, spray nozzles, and other items necessary to install the fire protection system. All piping and hardware shall be constructed to NPT standards. All electric equipment shall be mounted in Crouse-Hinds waterproof metal enclosures or boxes. Drawing of the support layout and details of the entire piping system shall be submitted to the Company for approval.

179. All piping, fittings, supports, deluge valves, etc., for the fire protection system shall be painted red. All galvanized surfaces shall be primed and treated to accept a painted finish. Field welding of pipe supports is unacceptable.

180. Piping shall be hot dipped galvanized electric resistance welded, Grade B, Schedule 40 conforming to ASTM Specification A-53.

181. Steel pipe hangers, clamps and other steel items used to support the piping shall be galvanized in accordance with ASTM standards.

182. All fittings shall be screw type, 150#, galvanized malleable iron (heavy class). All unions shall be 150#, galvanized, malleable iron, brass seat.

183. All flanges shall be 150#, cast iron, screwed flat face.

184. Brass-plain spray nozzles shall be provided. Brass nipples shall be furnished and installed with the nozzle so that the nozzles may be adjusted to the required position. Nozzles shall be installed such that maximum area can be wetted by the water spray. Spray nozzles shall be D3-65, 95 and 120 degrees C, Number 24 orifice size and manufactured by Grinell Co. or Company approved equivalent.

185. Fire detectors shall be fixed temperature, watertight and moisture-proof wiring conduit. The contacts shall be normally-open and close on temperature rise.

186. Manufacturer shall completely assemble the fire protection system in the factory and hydrostatic pressure tested. The fire protection system is required to withstand a pressure of 200 psig for four hours without any leaks or decay in pressure.

187. All flexible or compensating piping to the radiator banks and conservator to avoid transfer of sound from the main tank shall be bellows type made of stainless steel. No rubber material or dresser coupling is acceptable.

## **INSULATING FLUID**

188. A complete supply of oil shall be provided with each transformer to properly fill the main tank, tap changer diverter switch and selector switch compartments and all accessory compartments. The oil shall be delivered in tankers cleaned and properly sealed against contamination.

189. The oil shall be shipped at such times as the Company directs and on a schedule that permits a continuous filling operation. The manufacturer shall make provisions for the oil tanker to remain at the transformer location for seven (7) days while the oil is being loaded into the transformer.

190. The oil shall be shipped under a nitrogen blanket with a positive pressure on it at all times. The tanker shall have suitable gauges to monitor this pressure.

### Criteria For Oil

AS	TM
	Method
	D877
	D1816
	D924
	D971
	D974
	D1533
	D831, D2945, D1827
	D1500
	D1524
	D4059
	AS

191. If the oil as received contains foreign particles, excessive moisture or has a low dielectric strength, the oil may have to be treated to make the oil satisfactory for use or may have it returned to the supplier. The manufacturer shall incur the expenses of any treatment required.

## SPARE PARTS

192. The manufacturer shall supply a list of recommended spare parts for the equipment. Attachment No. 4 shows the Company's minimum requirements for spare parts. The manufacturer, as an option shall quote prices for these spare parts.

## LONG-TERM STORAGE

#### GENERAL

193. When specified in the Detail Specification - Part II, the transformer will be prepared for long term storage.

194. Manufacturer shall provide installation and test instructions for long-term storage of the unit in the instruction manual. As a minimum, the requirements detailed in Attachment No. 5 are to be included. The instructions shall be submitted for review and approval. One copy of the instruction manual shall be packaged in the front of the cargo container.

195. Upon arrival to the storage facility, the transformer will be partially assembled, dried out and vacuum oil filled. The radiator banks are to be self-standing without their support structures and provisions shall be provided for mounting the expansion tank on either the radiator bank or the main tank cover to allow for oil expansion while in storage. There shall be a minimum 12 inches from the bottom of the radiator bank to ground. All shipping gaskets shall be made of nitrille rubber or equal.

196. All components and accessories except the following items shall be prepared for long-term storage and stored in a closed top container.

- Main tank jacking bosses
- Radiator bank(s) and support(s)
- One pressure relief device for each main tank, selector
- switch and diverter switch(es) compartments and associated stand-off piping
- Expansion tank and accessories including mounting
- brackets and main compartment air cell bag and silica gel breathers
- Oil fill, oil drain and oil sampling valves
- Inert-gas pressure type system cabinet and piping
- Oil level gauges for all compartments
- Accessories which exceed the internal dimensions of the container

197. The aforementioned items shall be packaged together and be readily available for installation. The packing crate(s) may be shipped in the container but <u>must</u> be located in the front of the container without moving any equipment.

#### CARGO CONTAINER

198. Construction shall be of steel having a manufactured date not to exceed five years earlier than the date of purchase by the manufacturer. Heavy-duty construction to accommodate double stacking, hoisting by straddle carrier and with pockets to lift with a forklift truck when fully loaded. Interior wood, plywood paneling or door fillers is prohibited. Flooring may be timber panels or planks, which are steel-riveted to the base frame. Sidewalls must have recessed louvered ports for natural ventilation, located at the top and bottom, covered with metal or fiberglass screening to prevent nesting of insects or entry of rodents. The doors are to be fabricated without any filler material. Door hardware is to be mounted securely to the door panel and frame. The container's base frame must be structurally sound and rust-free, coated with an undercoating.

199. Containers may be purchased from a "used" market, then refurbished to good condition without holes, dents, rust, etc. Door edges will be rubber gasketed with all handles, hasps and hinges in good working order and lubricated.

200. Container's maximum dimensions are 20 feet (long) by 8 feet (wide) and 8 1/2 feet (high). In addition, the container shall be Type A, "CLOSED-TOP" container with solid, non-vented roofing shall be provided. Double door access on one end with rain shield over the doors is required. The double doors shall have provisions for pad locking.

201. Type B, "OPEN-TOP" containers with removable door-headers and tarpaulin with braces shall be provided to store <u>only</u> sound enclosure panels.

202. All interior and exterior metal surfaces of each container shall be primer coated as required, then painted dark-gray, ANSI 24, excluding the underside of the container. The roof surfaces will be weatherproofed by application of a "mobile trailer aluminum asphalt root-coating".

#### QUANTITY

203. The number of containers furnished per transformer shall be determined by the cubic footage and weight distribution required to stow accessories.

## PACKING AND STOWING

204. All components of the transformer that are removed for shipment of the main tank, radiators and conservator will be containerized.

205. The accessories shall be segregated and stowed by functional description and packed in reverse order to their installation. For example, all bushings and their adapters in the same container; load tap changer motor drive cabinet in front; and first accessories required during installation shall be in the front with the last item, e.g., fire protection system material in the rear.

206. All accessories will be crated, palletized and metal banded.

#### NO CELLULOSE PACKING MATERIAL IS ACCEPTABLE.

207. Maximum use of "runners" on crates, loose items, etc. shall be used to facilitate handling with a forklift truck and stacking of crates.

208. All accessories which require periodic inspection, e.g., storage of bushing adapters with dry air or nitrogen which require periodic monitoring of gas pressure, shall be accessible for inspection. Pressure gauge shall be installed on all gas filled accessories and oil level gauge on all oil filled accessories.

209. Sound enclosure panels shall be placed in a vertical position and secured.

210. The placement of crates shall be to evenly distribute the weight in the container and the total weight shall not exceed the load capacity of the container.

211. All contents within the container must be braced and blocked to prevent load-shift during transportation

212. Insects, infestation, borer-holes, etc., of crating, dunnage, containers and their flooring is unacceptable. Furnigation any/or any other required compliance to federal or local regulatory agencies at port of US entry or upon delivery to Con Edison will be the responsibility of and paid for by the manufacturer.

#### DOCUMENTATION

213. A packing list will be provided which provides an itemized description of the contents of each crate or accessory in the container. The packing list shall indicate the weight and dimensions of each crate or accessory.

214. A drawing showing the plan view and side elevation view will be provided showing the location, identification, weight and dimension of all items in the container.

215. Each crate or accessory will be marked with an identification number, weight and dimensions of the item.

## PAINTING

216. The transformer tank(s) and all the accessories shall be prepared and painted in accordance with the Con Edison Specification No. CE-TS-07. All radiators shall be painted by the flow or dipping method; spraying or brushing will not be accepted.

217. The paint color shall be US Federal Standard 595A26120 (Dark Gray Brown) or Pittsburgh Paint Color D4639 (Forest Brown), unless otherwise stated in the Detail Specification - Part II. The manufacturer shall also supply with their proposal sample paint chip.

## FACTORY TESTS

218. The manufacturer shall make certified factory tests in accordance with the latest ANSI or IEEE Standards and such other customary factory tests as may be necessary to assure that all equipment is satisfactory and in accordance with this specification. In addition, the following specific test shall be made and three copies of certified factory test reports shall be submitted for the Company's approval prior to shipment release. A copy of the transformer nameplate drawing shall be included with each copy of the certified test report. Nameplate drawing shall be completely filled in and shall contain all information contained on the metal transformer nameplate.

#### TEST ON ALL TRANSFORMERS (PRODUCTION TESTS)

219. Core loss as follows:

- On rated voltage tap position
- With the de-energized tap changer on the neutral position and the LTC on the maximum no-load loss position. State these loss positions in the test report.
- With de-energized tap changer and LTC on positions occupied during heat run.

220. Copper loss at the full load self-cooled rating and at the full load forced-cooled rating:

- On rated voltage tap position.
- With the de-energized tap changer on the neutral position and the LTC on the maximum
- copper loss position. State these loss positions in the test report.
- With the de-energized tap changer and LTC on positions occupied during heat run.

221. Exciting current at rated voltage.

222. Positive, negative and zero sequence through impedance and reactance, based on the self-cooled rating and 55 degrees C temperature rise rating for the following conditions:

- With the de-energized tap changer on the maximum rated and minimum voltage positions and the LTC equipment held on rated voltage position.
- With the LTC equipment on the maximum and minimum voltage positions and the de-energized tap changer held on the rated voltage position. State in the test report what
- combination of de-energized tap changer and LTC voltage positions give maximum impedance value and what this value is.

223. The sound level test shall be performed at highest rating with all fans and pumps running. Both sound power and pressure level measurements shall be made. One-third octave band frequency measurements shall be performed at frequencies from 63 to 4000 hertz. The sound level test shall be in accordance with ANSI/IEEE C57.12.90, with all the magnetic circuits fully energized.

224. Impulse test and switching surge test.

225. A three-phase induced potential test. The test voltage shall be brought up to 150 percent of the maximum system operating voltage and a partial discharge measurement recorded. The test voltage shall then be raised to 175 percent of the maximum operating voltage for 7200 cycles. Record the partial discharge level. The test voltage shall then be returned to 150 percent of the maximum system operating voltage and held for one hour with partial discharge measurements recorded. Unless otherwise stated in Part II of the Detail Specification, the corona level shall not exceed 500 microvolts at 175 percent of the maximum operating voltage. Partial discharge levels shall be recorded at five-minute intervals for the duration of the test. Continuous RIV monitoring shall accompany these tests and a satisfactory RIV must show a constant or downward trend during the one hour 150 percent voltage test. A combustible gas-in-oil analysis shall be made both before and after this test, and the results reported. It should be noted that the maximum operating voltage is defined as 105 percent of the rated system voltage.

226. Ratio test on rated voltage connection and all tap positions.

227. Phase relation test.

228. 120 Volt, 60 Hertz, 1 phase excitation test on each winding. Wye connected winding shall be tested line end to neutral. The test shall be done with the tap changer in 1R, neutral and 1L positions. In the case of a two winding transformer the test should be done from the primary with the secondary winding open circuited and vice versa.

229. 10 kV, 60 Hz, Doble power factor test on both the high and low voltage windings.

230. 10 kV, 60 Hz excitation current test on each high voltage winding.

231. A dc dielectric proof test for 5 minutes on each winding is required. Microampere readings shall be recorded every 60 seconds.

232. Bushing

- ANSI Standard production test
- Capacitance and power factor data. All oil impregnated paper bushings rated below 230 kV shall have a power factor below 0.5 percent and below 0.35 percent for bushings
- rated above 230 kV.
- Partial discharge (corona) test at rated line-to-ground voltage and at 150 percent of that voltage
- Bushing potential device capacitance data

233. Certification that all gauges and contacts have been calibrated. The final contact settings shall be listed.

233.1 The manufacturer shall furnish the necessary data to enable the Company to make a calibration check on winding temperature indicators and thermal relays. This should include a sufficient number of heater coil current and corresponding temperature rise values to permit checking the instruments in place with top oil temperatures as low as 0 degrees C and as high as 50 degrees C and with circulating oil pumps (if any) not running.

#### **TESTS ON APPROVED DESIGN**

234. Heat runs at 65 degrees C, self-cooled rated capacity, and at 65 degrees C Rise, maximum rated capacity, until constant temperatures are obtained. Both heat runs shall be made with the de-energized tap changer and LTC equipment on the voltage taps which correspond to <u>maximum</u> transformer loss positions at 0.8 power factor load while holding the transformer output voltage to its rated value. Rated value is defined as the no-load voltage in the secondary with rated voltage applied to the primary with the de-energized tap changer and LTC both on neutral positions. The de-energized tap changer and LTC tap positions during these tests shall be stated in the factory test report, together with the winding average, hot-spot temperatures, and top oil temperature rise.

## EI-4161, REV. 3 JANUARY, 1993

#### 235. The following data shall also be included on the certified test report.

- Combustible gas-in-oil analysis before and after the heat run test(s)
- Oil rise vs. per unit loss curve (log-log) (M-exponent)
- Winding rise vs. per unit current curve (log-log) (N-exponent)
- Oil rise vs. time curve (semi-log) (time constant)
- Hot spot conductor temperatures rise over average winding rise at full load.
- Top and bottom oil temperature rise over ambient temperature
- Average winding temperature rise over ambient temperature
- Top Oil temperature thermal time constant
- Winding temperature thermal time constant
- Calibration and base-line thermal data for winding hot-spot temperature and oil temperature measurement probes.

## CONSTRUCTABILITY

236. The transformer will be evaluated on the basis of installation assembly time and procedure. The manufacturer shall submit a separate section in the proposal detailing all components which are shipped loose and which require assembly, the steps being considered to facilitate minimizing installation time and shall include the following specific information in his proposal:

- The estimated total normal time or man-hours required to assemble and test the transformer. This time shall be expressed in the number of work shifts required for each of the following: rigging, mechanical assembly, electrical assembly and testing.
- The list of items which must be assembled in the field.
- The manufacturer shall ship the main tank with gas cabinet, control cabinets, gauges, valves, and load tap changer, including motor-drive attached if the shipping dimensions permit.

## MAINTAINABILITY

237. The transformer will be evaluated on the basis of maintenance inspection frequency and requirements. The manufacturer shall submit a separate section in the proposal detailing inspection interval, maintenance procedure, test, and replacement criteria and procedure for all components of the transformer.

## SHIPPING INSTRUCTIONS

238. Where bushings are removed for shipment, the corresponding winding leads shall be grounded to the bushing shipping cover of the transformer. In addition, all bushings are to be grounded to the tank wall for shipment and storage.

239. Manufacturer shall make shipment only after the Electrical Substation Equipment Subsection of Electrical Engineering Department has approved test results. The manufacturer shall be responsible for the preparation of the unit for shipment in a manner governed by the mode of transportation.

240. The manufacturer shall ship this equipment factory assembled to the maximum extent possible, consistent with railroad and trailer limitations. Local shipping limitations are as indicated in the Detail Specification - Part II.

241. The unit will be shipped with dry air. The manufacturer will verify that the unit contains a minimum of 19.5 percent oxygen content and maximum 21 percent before shipment. The combustible gas content shall be less than 0.5 percent. On the top of each manhole the following: will be clearly painted

### "HARMFUL ATMOSPHERE! DO NOT ENTER!"

242. Transformer dry air pressure, oxygen content, moisture level, gas-in-gas analysis for quantity of combustible gases, including carbon monoxide and carbon dioxide, and temperature data, recorded immediately prior to shipment, shall be sent to the Electrical Substation Equipment Engineer.

243. Three copies of the complete packing list for the transformer and parts shall be sent to our Construction Department, Construction Services Section, prior to shipment of the unit. Two additional copies shall be sent to the Electrical Substation Equipment Subsection. Packing list is required at time of shipment. Receipt of equipment will not be accepted if list is not received prior to delivery.

244. Each transformer part shipped loose and all crates shall be marked with an identifying sequential numbering system prior to shipment. The applicable identifying "package" number shall also be recorded against each item on the packing list. The packing list shall identify the quantity, part number and description of each item.

245. One copy of this finalized packing list shall be affixed to the outside of each loose piece, box, etc., in a weatherproof envelope and four copies shall be mailed to our Expediting and Traffic Bureau.

246. Each box or crate of transformer parts shall be stenciled with the manufacturer's recommended storage instruction indoors/outdoors relative to their content.

247. Steel tie-rods, used to brace the transformer on the rail car, shall have a minimum diameter of 1 1/4 inch.

248. Handling of the transformer during transit shall be monitored by impact recorder(s), furnished by the manufacturer, having a minimum 60 days/2-way capability. The impact recorder shall have a quality control certification date label attached on the unit. The impact recorder shall be mounted on the transformer, not the railroad car, if applicable. Recorders furnished by the Railroad Company are unacceptable.

249. Transformers or their parts shall not be rendered to a carrier without 48 hours prior notification by the shipper to our Expediting and Traffic Bureau and receipt of verbal authorization to ship.

## DRAWINGS, INSTRUCTION MANUALS AND PHOTOGRAPHS

250. Drawings and manuals of instruction furnished under this Specification shall be in accordance with the latest revision of Specification EI-4008.

251. Manufacturer shall provide installation and test instructions for assembly, dryout and testing the unit in the instruction manual. The instructions shall be in accordance with Company's Electrical Engineering Specifications EI-1002, Specification For Proof Testing of Station Electrical Equipment and Circuits, and EI-1003, Installation and Test Specification for Oil-Immersed Power Transformers, Reactors and Regulators. The instructions shall be submitted for review and approval. One copy of the instruction manual shall included in the control cabinet.

252. The following data is required in the instruction manual:

252.1 An itemized list of components

252.2 All parts and apparatus external of the main tank including the quantity of each item. Indication of whether items are non-removable. Indication of those items which are to be removed for shipment. Parts of the transformer to be removed for shipment shall be indicated by an asterisk (\*) in the itemized description list shown on the outline drawing.

252.3 Indication of whether main tank is shipped dry-air or oil filled.

252.4 Certify shipping weight of main tank, radiator or cooler bank(s) and expansion tank, if applicable.

252.5 Drawing showing a "Side" and "End" view of main tank, plus radiator or cooler bank(s) and load tap changer compartment (if shipped removed) as they are disassembled for shipment. Include as much dimensional shipping data as possible:

- Show maximum shipping height, length and width of main tank(s), radiator or cooler bank(s), expansion tank(s) and load tap changer (when shipped separately). Shipping height to be less sub-bases which are shipped separately. Indicate the Bill of Material number of the highest accessory, not removed for shipment.
- Show base length and width of main tank, including valves, etc.
- Show height from base line of main tank up to base of, or lowest mounted accessory to, the load tap changer, control and inert air cabinets.
- Show all primary lifting points.
- Show length and width dimensions between centers of lifting points.
- Provide detail sketch of each itemized lifting point (lug or capstan) including distance from base of lifting point to top of cover.
- Show centerline of main tank, radiator banks, and load tap changer, if shipped separately.
- Show shipping centerline of gravity of main tank, radiator banks and load tap changer, if shipped separately.
- Show centerline of gravity of main tank when oil filled.
- Provide detail sketch of each itemized jacking point (bracket or boss), including distance from bearing surface of jacking point to baseline of main tank and load tap changer, if shipped separately.
- Outline drawings shall also indicate the dimensions shown in Attachment No. 6.

• The weight and dimension of all bushings shall be added to their itemized parts description list if the main tank has shipping split, a detail-shipping sketch of the permanent cover shall be provided.

253. Three (3) sets of 8 inches by 10 inches photographs showing general construction and arrangement of components shall be supplied with each transformer and shall include the following:

- Core structure before coils are in place (core form units only).
- Core and coil assembly-showing details of coil bracing before LTC cabling is installed.
- Empty tank.
- Core and coil assembly before tanking showing details of cable bracing.
- Completely assembled core and coil assembly before tanking.
- Top view of transformer before main tank cover is welded on showing placement of core and coils, series transformers, preventive autos, etc.
- Overall external view of completely assembled transformer.
- Sound enclosure assembly (if applicable).

## **GUARANTEE AND WARRANTY**

254. The equipment will meet all requirements of the specification and will give long, safe, and dependable service.

255. The manufacturer will repair or replace the equipment or any parts which are found to be defective in material or workmanship within 12 months from date of energization or 18 months from date of Company's receipt acceptance of the main tank and accessories, whichever occurs sooner.

## EXTENDED WARRANTY

256. The manufacturer is required to submit a quotation for in-and-out warranty for 36 months from date of energization or 42 months from date of Company's receipt and acceptance of the main tank and accessories. The Company reserves the right to purchase the above warranty at its option.

## **INSPECTION**

257. In case the Company wants to inspect the equipment before shipment from the factory, the Company's representative shall be allowed free access at all reasonable times to the manufacturer's shop. Failure of the Company's representative or inspector to call

attention to any defect in material or workmanship shall not be construed as acceptance of the same.

## **PROPOSAL DATA**

#### GENERAL

258. The manufacturer shall submit a complete proposal covering equipment complying with this specification and containing all of the information requested in Part III. The manufacturer shall tabulate all data as required on the forms supplied in Part III, and return these forms complete with his proposal. The manufacturer shall supply one priced copy for the Purchasing Department and five unpaired copies of the proposal for technical review.

#### NO CONSIDERATION WILL BE GIVEN TO AN INCOMPLETE PROPOSAL.

259. In case, the proposed equipment duplicates or is similar to that furnished by the manufacturer on a previous order, reference may be made to the previous order but such reference alone will not be accepted as constituting, nor as a substitute for a complete proposal. If a choice of propositions is offered, the main proposal shall comply with this specification and all others shall be alternates.

#### **EVALUATION OF PROPOSALS**

260. All accepted proposals will be compared on an economic basis to determine the penalty to be applied against each proposal. To guide the manufacturer in distributing losses, the load value for evaluation and the capitalized value of core and copper loss will be supplied in Detail Specification - Part III. It should be noted that the losses will be evaluated at the maximum loss tap changer tap position(s) and at the maximum 65 degrees C nameplate rating.

261. The loss evaluation is calculated by the annual cost method. The transformer annual fixed charge rate is carrying charge rate times the final adjusted price of the transformer, including any estimated price escalation to the time of delivery. The cost of energy for no-load and rated load will be added to the annualized adjusted price of the transformer.

262. A first cost loss penalty will be assessed against the transformer capital cost when the tested losses exceed the guaranteed losses. The penalty shall be the difference between the tested total evaluated annual losses cost and the specification guaranteed evaluated annual losses cost divided by the carrying charge rate.

263. No credit shall accrue to the manufacturer if the total evaluation for tested losses is less than the total evaluation for guaranteed losses.

### STATEMENT OF EXCEPTION

264. In case the manufacturer wishes to take exception to any of this Specification, he shall state in his proposal the points of variation between his proposal and the Specification and the reasons therefore. Any statement in his proposal or on his drawings which differs from the requirements of this Specification, must be specifically referred to in a "Statement of Exceptions" to be considered as constituting an exception to the Specification.

D. Chu

Leo S. Savio Engineering Section Manager Equipment & Field Engineering

<b>REVISION 3</b> :	FILE: Electrical
General Revision	Substation & Transmission
	Engineering Section - Maintenance
	and Test Standards File

#### Attachments

No. 1	Plate No. 3008-2
No. 2	Tank Wall Access Opening Sealing Procedure
No. 3	Shipping Split or Throat Sealing Procedure
No. 4	Spare Parts List
No. 5	Long Term Storage Requirements
No. 6	Outline Drawing Dimensional Requirements

#### Attached Specifications

EI-4008 General Specification For the Provision of Manufacturer's Drawings and Instruction Books and Test Reports For Electrical Equipment CE-TS-07-84 Approved Coatings to be Used on New Electrical Equipment

Attached Company Drawings

EQUIPMENT STANDARDS	EI-4161, REV. 3 JANUARY, 1993
A239621	Terminal Block Arrangement for 345/138 kV Transformer
A239576	Terminal Block Arrangement for 138/13 kV and 138/27 kV
	Transformer
B190950	All Stations Relay Board Nameplates
B167934	Schematic Diagram of Typical Tap Changer Control
B167935	Schematic Wiring For Oil Insulated Transformers Cooling
	Equipment
B239506	Transformer Paralleling Standard
C239482	List of Alarms for Transformer Annunciators

ATTACHMENT NO. 1

Control Cable Terminations .pa .ce3 ATTACHMENT NO. 2

Tank Wall Access Opening Sealing Procedure .pa .ce3 ATTACHMENT NO. 3

Shipping Split or Throat Sealing Procedure .pa .ce2 ATTACHMENT NO. 4

Spare Parts List 2 1^^-^^High voltage bushing 1^^\_^Low voltage bushing (secondary and tertiary) 1^^-^Neutral bushing 1^^-^^Bushing potential device with lead 10^-^^Annunciator modules 1^^-^^Complete diverter switch assembly 1^^-^Set of interrupter contacts or set of transfer switches ^^^^for all three phases 1^^\_^Set of reversing switch contacts, moving and ^^^^stationary 1^^-^Set of selector switch contacts, moving and ^^^^stationary 1^^-^^Tap changer barrier board separating main tank and ^^^^^selector compartment

1^^-^Tap changer motor drive assembly

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1^^-^Voltage regulating relay

1^^-^^Complete set of fuses for control and tap changer

^^^^control circuits

1^^-^^Auxiliary current transformer(s) for tap changer

^^^^^control

1^^-^^Qualitrol liquid temperature gauge

1^^-^^Qualitrol winding temperature gauge

1^^-^Qualitrol gas collection device

1^^-^^Qualitrol fault pressure relay with seal-in circuit

1^^-^^Qualitrol flow gauge

1^^-^Cooling pump

1^^\_^Cooling fans

1^^-^^Motor contactors used to control cooling equipment

1^^\_^Main incoming ac power circuit breakers

1^^-^Tap changer circuit breaker

1^^-^Cooling equipment circuit breakers

## ATTACHMENT NO. 5

#### Long Term Storage Requirements

#### <u>General</u>

The unit is to be received and stored in accordance with the following:

- The unit is to be checked against the purchase order and specification for conformance and completeness.
- Electrical Engineering Specification EI-1003, EI-1005 and EI-4161, Long Term Storage Section; latest revision.
- Corporate Instruction CI-330-11.
- Engineering Receipt Inspection Report Manufacturer's Outline Drawing
- Manufacturer's Component/Parts Material List

Install mechanical pressure relief devices with adapters/turrets.

The Electrical Substation Equipment Subsection is to be notified of the progress of work, tap changer inspection and test results.

The Transportation and Stores Department will insure that the following is completed for turnover:

- Photographs are required of this unit, as stored, from opposite diagonal directions, the top cover and any additional photographs which may be required of the control cabinet to document their condition.
- A complete turnover history jacket shall be prepared with all test results, unit information, photographs and inventory. A copy of this history jacket is to be provided to the User Department, Stores and the Electrical Substation & Transmission Engineer.
- A turnover memorandum is to be prepared for the subject unit that will include a check-off of the above items and a joint unit inspection report by representatives of the User Department, Stores, Construction and Engineering Vice President signatures.

#### Assembly and Oil Filling

For long term storage, the transformer has to be partially assembled without the bushings, if shipped separately. The sequence of assembly of parts is a follows:

• Position the main tank on its foundation.

- Place radiator banks or cooler banks on their transport supports on the HV or LV side of the main tank.
- Install mechanical relief devices on tap changer diverte and selector switch compartments and the main tank. Install standoff pipes, if provided.
- Mount the conservator tank, if applicable, on the corresponding radiator bank(s) and make all connections between flanges on pipe ends of the banks and conservator using 1-inch pipe.
- Make 1-inch pipe connections between radiator banks and main tank.
- Make 1-inch pipe connections between tap changer (LTC) conservator compartments to respective diverter switch and selector switch compartments.

Note:

All shipping covers or flanges shall be removed from the transformer or radiator banks prior to drilling or welding.

Dryout and oil filling shall be done in accordance with EI-1003. When the Electrical Substation Equipment Sub-Section has approved hot-oil dryout, 10 percent of the main tank oil shall be circulated. After oil filling, all silica gel dehydrating breathers are to be installed. :eol. .pa

.ce3 ATTACHMENT NO. 6

Outline Drawing Dimensional Requirements

## Attachment DPS 9-2 and DPS-9-3

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## EQUIPMENT & FIELD ENGINEERING DEPARTMENT SUBSTATION EQUIPMENT ENGINEERING SPECIFICATION NO. EI-4020-46 OCTOBER, 2005

#### PART II

## DETAIL PURCHASE SPECIFICATION FOR 138kV CIRCUIT SWITCHERS FOR CEDAR STREET, ROCKVIEW, WASHINGTON STREET, RIVERSIDE AND DUNWOODIE SUBSTATIONS

#### **LOCATION**

1.00 This detailed specification, together with General Specification EI-4020, Revision 2, covers the requirements for 138kV circuit switchers and circuit interrupters to be supplied for installation at the Cedar Street Substation, located at Union Street, New Rochelle, NY 10801; the Rockview Substation located at 125 Smart Avenue, Yonkers, NY 10704; the Washington Street Substation, located at Lyons Place and Hartford Ave., Mount Vernon, NY; the Riverside Substation located at 700 11<sup>th</sup> Avenue, NY, NY 10019 and the Dunwoodie Substation, located at 125 Smart Avenue, Yonkers, NY 10704.

#### SYSTEM CONDITIONS

2.00 The nominal system voltage is 138kV with a 63kA short circuit current availability at the point of application.

3.00 The nominal continuous current of the required equipment shall be 1200Amperes.

4.00 The equipment for the Cedar Street, the Rockview, the Washington Street and the Riverside Substations will be used for switching a 138/13.8kV, 65MVA substation transformer. The primary windings of the transformer are delta connected. The secondary windings are wye connected and grounded through a 1.0-Ohm neutral reactor. The circuit switcher for the Dunwoodie Substation will be used for switching a 138kV cable, 1-600kcmil conductor per phase, approximately 560 feet in length, terminating at open air potheads connected to a 138/13.8kV, 65MVA substation transformer. The primary windings of the transformer are delta connected. The primary windings of the transformer are delta connected.

#### QUANTITY AND RATING

The required equipment shall consist of:

#### Cedar Street Substation

5.00 One 145kV, 1200 Amperes, 650kV BIL circuit interrupter. This circuit interrupter shall be designated as CI-3 as indicated on Drawings A217813-MP, 350386-00 and

A217755-12 attached. The unit will have a structure height as indicated on Drawings 350386-00 and A217755-12 attached.

5.10 The circuit interrupter shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

5.20 The circuit switcher shall be three pole, electrically (motor) gang operated.

5.30 One-three pole, ground switch shall be supplied on the transformer side of the circuit interrupter as indicated on the attached Drawing 350386-00 and A217813-MP. Ground bus shall be supplied on the circuit switcher structure for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

6.00 Two 145kV, 1200 Amperes, 650kV BIL "V" type circuit switchers shall be supplied. These circuit switchers shall be designated as CS-3 and CS-13 as indicated on Drawings A217813-MP, 350386-00 and A217755-12 attached. The units will have a structure height as indicated on Drawing 350386-00, attached.

6.10 The circuit switchers and circuit interrupters shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

6.20 The circuit switchers shall be three pole, electrically (motor) gang operated.

6.30 One-three pole, gang operated ground switch shall be supplied on the hinged (transformer) side of the "V" type circuit switcher CS-3 as indicated on Drawing 350386-00 and A217813-MP, attached. One-three pole, gang operated ground switch shall be supplied on the jaw (pothead) side of the "V" type circuit switcher CS-13 as indicated on Drawing 350386-00 and A217813-MP, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

6.30 Three-single pole, individually operated ground switches shall be supplied on the jaw (pothead) side of the "V" type circuit switcher CS-3 as indicated on Drawing 350386-00 and A217813-MP, attached. Three-single pole, individually operated ground switches shall be supplied on the hinged (pothead) side of the "V" type circuit switcher CS-13 as indicated on Drawing 350386-00 and A217813-MP, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

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#### Rockview Substation

7.00 Three 145kV, 1200 Amperes, 650kV BIL "V" type circuit switcher shall be supplied. These circuit switchers shall be designated as CS-1, CS-2 and CS-4 as indicated on Drawing 347530-00, attached. The unit will have a structure height as indicated on Drawing 347532-00 and 347534-00, attached.

7.10 The circuit switchers and circuit interrupters shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

7.20 The circuit switcher shall be three pole, electrically (motor) gang operated.

7.30 One-three pole, gang operated ground switch shall be supplied on the hinged (transformer) side of the "V" type circuit switcher as indicated on Drawings 347532-00 and 347534-00, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

7.30 Three-single pole, individually operated ground switches shall be supplied on the jaw (pothead) side of the "V" type circuit switcher as indicated on Drawing 347532-00 and 347534-00, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

#### Washington Street Substation

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8.00 Two 145kV, 1200 Amperes, 650kV BIL "V" type circuit switcher shall be supplied. These circuit switchers shall be designated as CS-1, and CS-3 as indicated on Drawings 131050-24, 349574-00 and 349575-00, attached. The unit will have a structure height as indicated on Drawings 349574-00 and 349575-00, attached.

8.10 The circuit switchers and circuit interrupters shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

8.20 The circuit switcher shall be three pole, electrically (motor) gang operated.

8.30 One-three pole, gang operated ground switch shall be supplied on the hinged (transformer) side of the "V" type circuit switchers as indicated on Drawings 131050-24, 349574-00 and 349575-00, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be
### EQUIPMENT STANDARDS

### SPECIFICATION NO. EI-4020-46 OCTOBER, 2005

brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

8.30 Three-single pole, individually operated ground switches shall be supplied on the jaw (pothead) side of the "V" type circuit switcher as indicated on Drawings 131050-24, 349574-00 and 349575-00, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

8.40 The operating mechanism for circuit switcher CS-3 shall be located off the A phase end of the structure. Con Edison will provide the structure for this circuit switcher. The manufacturer shall provide mounting details for this unit.

#### **Riverside** Substation

9.00 Five 145kV, 1200 Amperes, 650kV BIL circuit interrupters. These circuit interrupters shall be designated as CI-1, CI-2, CI-3, CI-4 and CI-5 as indicated on Drawing 343645-00, attached. The units will have a structure height as indicated on Drawings 346720-00, attached. This drawing is typical of the remaining installations.
9.10 The circuit interrupter shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

9.20 The circuit switcher shall be three pole, electrically (motor) gang operated.

9.30 One-three pole, ground switch shall be supplied on the transformer side of the circuit interrupter as indicated on the attached Drawings 343645-00 and 346720-00. Ground bus shall be supplied on the circuit switcher structure for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

10.00 Five 145kV, 1200 Amperes, 650kV BIL "V" type circuit switchers shall be supplied. These circuit switchers shall be designated as CS-1, CS-2, CS-3, CS-4 and CS-5, as indicated on Drawing 343645-00, attached. The units will have a structure height as indicated on Drawings 346720-00, attached. This drawing is typical of the remaining installations.

10.10 The circuit switchers shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

10.20 The circuit switchers shall be three pole, electrically (motor) gang operated.

10.30 One-three pole, gang operated ground switch shall be supplied on the hinged (transformer) side of the "V" type circuit switchers as indicated on

### EQUIPMENT **STANDARDS**

### SPECIFICATION NO. EI-4020-46 OCTOBER, 2005

Drawing 343645-00, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

10.30 Three-single pole, individually operated ground switches shall be supplied on the jaw (pothead) side of the "V" type circuit switchers as indicated on Drawing 343645-00, attached. Ground bus shall be supplied on the circuit switcher for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located within the overall interrupter and circuit switcher footprint.

### Dunwoodie Substation

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11.00 Four 145kV, 1200 Amperes, 650kV BIL circuit switchers with a power operated vertical break disconnect switch. These circuit switchers shall be designated as CS-1, CS-2, CS-3 and CS-4 as indicated on Drawings 347588-00, 347589-00 and 347590-00, attached. The units will have a structure height as indicated on Drawings 347588-00, 347589-00 and 347590-00, attached. 

11.10 The circuit switchers shall have a rated interrupting capability of 20kA symmetrical and a 63kA asymmetrical momentary current rating.

11.20 The circuit switcher shall be three pole, electrically (motor) gang operated.

11.30 Three-single pole, ground switches shall be supplied on the pothead side of the circuit switchers as indicated on the Drawings 347588-00, 347589-00 and 347590-00, attached. Ground bus shall be supplied on the circuit switcher structure for connection to the ground switches. These grounds shall be brought down to the structure grounds. All ground switches shall be located perpendicular to the circuit switcher live parts.

#### MISCELLANEOUS REQUIREMENT

12.00 The insulators shall be standard gray porcelain.

13.00 The circuit switchers shall be braced to withstand the electrical and magnetic forces associated with a fault current of 63kA.

14.00 All circuit switchers shall be provided with SF6 gas pressure monitors and lowpressure alarms.

15.00 Paragraph 26.00 of the General Specification calls for eight "a" and eight "b" auxiliary contacts for Con Edison use. The circuit switchers and circuit interrupters supplied shall have ten "a" and "b" auxiliary contacts for Con Edison use.

### EOUIPMENT **STANDARDS**

### SPECIFICATION NO. EI-4020-46 OCTOBER, 2005

16.00 Maintenance requirements shall be provided in sufficient detail to be evaluated by the Con Edison Maintenance Department.

17.00 Construction details shall be provided in the proposal for the Con Edison Construction Department to evaluate labor requirements for equipment installation. This shall include the required sequence of assembly. Any special rigging requirements are to be clearly indicated.

18.00 The circuit switchers shall be assembled to the fullest extent possible to reduce the required installation time.

19.00 Three days of a field service engineer shall be supplied for each circuit switcher and itemized separately in the proposal.

20.00 Paragraph 46.00 of the General Specification shall reference Specification EI-4008, latest revision.

PJD

Patrick J. Di Lillo Technical Specialist

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Attachments: EI-4020, Rev. 2

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Drawings:

Cedar Street Substation 350386-00 Installation of Transformer 3-Plan and Sections A217813-MP One Line Diagram A212255-12 General Arrangement of 138/13kV Equipment

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**Rockview Substation** 

347530-00 One Line Diagram

General Arrangement of 138/13kV Equipment-Plan 347532-00 347534-00

General Arrangement of 138/13kV Equipment-Sections

### Washington Street

131050-24	One Line Diagram
349574-00	Installation of Circuit Switcher for Tr. 1-Plans and Sections
349575-00	Installation of Circuit Switcher for Tr. 3-Plans and Sections

# SPECIFICATION NO. EI-4020-46 OCTOBER, 2005

# Riverside

EQUIPMENT STANDARDS

10101010	
343645-00	One Line Diagram
346720-00	Transformer Vault 1 Equipment-Plan

20-00	Transformer	Vault 1	Equipment-Plan	and Sections-Typical

### Dunwoodie 347588-00

347588-00	Modification of Feeders for Granite Hill-Plan and Sections
347589-00	Modification of Feeders for Granite Hill-Plan and Sections
347590-00	Modification of Feeders for Granite Hill-Sections

# Attachment DPS 9-4



650-5853 5-16 (PAD)

# CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. 4 IRVING PLACE NEW YORK, NEW YORK 10003

# ENGINEERING SPECIFICATION

### **CE-TS-3007**

# REQUEST FOR PROPOSAL (RFP) FOR SUPPLY A COMPLETE 138 KV SOLID DIELECTRIC CABLE (SD) SYSTEM, CONNECTING THE "WASHINGTON STREET" SUBSTATION TO THE "CEDAR STREET" SUBSTATION

### **REVISION 00**

### NOVEMBER 2005

**Prepared By:** 

Arnold Wong, Transmission Feeders Engineering

Approved By:

# Reza Ghafurian, Section Manager

# SECTION I - GENERAL REQUIREMENTS

### 1.0 PURPOSE

The purpose of this Request For Proposal (RFP) is to solicit a proposal to supply a complete Solid Dielectric (SD) 138 kV cable system, connecting the "Washington Street" Switching Station to the "Cedar Street" Substation in Westchester County, New York, hereby designated as Feeders 38W09T. Technical requirements of the cable system are defined in Con Edison specification CE-TS-4185 Technical Specification for 138-345 kV XLPE Insulated Power Cable and Associated Accessories.

## 2.0 **PROJECT DESCRIPTION**

Consolidated Edison Company of New York (COMPANY) will be installing a 3-phase, single conductor 138-kV solid dielectric feeder in Westchester County, New York. This project is designated as the "Washington Street to Cedar Street" project and includes the installation of a one new feeder designated as 38W09T, routed in a concrete encased Fiberglass Reinforced Epoxy (FRE) duct bank from Con Edison's Washington Street Area Substation to Cedar Street Area Substation. This feeder will be comprised of approximately 50,000 conductor feet of single-phase solid dielectric cable.

The feeder will be installed in a double feeder duct bank to be constructed by Con Edison. The concrete duct banks configurations are detailed on Drawing 348702. Sixinch IPS (6.42 inch ID) based fiberglass reinforced epoxy (FRE) ducts will be used for each cable leg. A three-inch IPS (3.35 inch ID) based FRE conduit will be used for installation of ground continuity conductor. Manhole inside dimensions are 19'-6" L x 5'-4" W x 6'-1" H with two manhole entrances. See Drawing 2005MB2428 for manhole and manhole end wall details.

The Washington Street Substation is located at 210 Lyons Place, Mt. Vernon, NY, 10553. The Cedar Street Substation is located at Cedar Street, New Rochelle, NY, 10801.

## 3.0 APPLICABLE STANDARDS AND REFERENCES

Listing of specific codes and standards that apply to systems design or equipment provided in the Section III Part 1 and include the latest editions of design specifications CE-TS-4185, AEIC-CS7, IEEE-404, IEEE-48 and IEC-60840.

### 4.0 QUANTITY AND RATING

The following quantities are approximate based on initial routing design. It is anticipated that nine manhole splices will be required. The vendor should provide unit costs for each material listed below:

4.1 Approximately 50,000 conductor feet of 138 kV 1500 kcmil copper conductor, solid dielectric cable in accordance with applicable section of specification CE-TS-4185.

#### Page 2 of 6

Consolidated Edison Company of New York Electrical Engineering Department

- 4.2 Approximately 6,000 feet of spare 138 kV 1500 kcmil copper conductor, solid dielectric cable, to be supplied as three lengths of the longest manhole to manhole section, or 2000 feet, which ever is longest. The spare reels shall be shipped with the first shipment.
- 4.3 Approximately 16,000 feet of the 600V insulated ground conductor cable.
- 4.4 27 ea single-phase insulated joints for 138 kV 1500 kcmil copper conductor XLPE insulated cable. The number of sheath interrupt and straight joints shall be determined by the supplier based upon his proposed sheath ground design.
- 4.5 3 ea single-phase sheath break spare joints for 138 kV 1500 kcmil copper conductor XLPE insulated cable
- 4.6 3 ea single-phase insulated spare joints for 138 kV 1500 kcmil copper conductor XLPE insulated cable.
- 4.7 Quantities of Link Boxes for manhole installation and terminal installation shall be determined by the supplier based upon his proposed grounding scheme and shall include one spare box and ten spare surge voltage limiters.
- 9 ea 138 kV solid dielectric cable outdoor terminations for 1500 kcmil conductor, including three spare terminators packaged for long-term storage. Terminations should be supplied in accordance with applicable section of Specification CE-TS-4185, IEEE-48, EO-14292-D and drawing #301820, including all necessary base plates, stand-off insulators (between termination base plate and steelwork support structure) and take-off connectors.
- 4.8 Supply all necessary hardware supports and clamps for mounting cable and accessories at the terminal structures and in manholes. Six spare cable clamps are required and shall be packaged for long term storage.
- 4.9 Supply leak detection systems for outdoor terminations.

# 5 CONTRACT DRAWINGS

All cable and accessory drawings should be provided in AutoCAD format (at least Revision 2002), size 'A' (44" x 34").

### 6 SUBMITTALS

- 6.1 Bid information to be submitted by bidders in electronic and hard copy format (three copies). The Schedules of Guarantees of specification CE-TS-4185 including Schedule of Deviations must be submitted. The bid shall not be considered technically complete without the schedules.
- 6.2 A detailed bill of materials, including required spare material, shall be submitted.

Page 3 of 6

Consolidated Edison Company of New York Electrical Engineering Department

## 7 QUALITY ASSURANCE

- 7.1 Standard tests:
  - 7.1.1 Cable Qualification, Sample and Type tests in accordance with the latest edition of AEIC-CS7 and IEC-60840 (11).
  - 7.1.2 System Type test in accordance with the latest edition of IEC-60840 (12).

7.1.3 Joint outer protection test in accordance with IEC-60840 (Annex D).

### 7.2 Field Supervision

The vendor must supervise all splicing operations performed by Con Edison and include this cost in their bid. If necessary, Con Edison will splice 24 hours a day, 7 days a week to complete the project in a timely manner.

## 8 **PROPOSALS**

Con Edison shall evaluate the technical aspects of all fully compliant main offer and alternative offers on a number of criteria including technical compliance, experience with similar designs, service experience, ease of installation, simplicity of design and maintenance requirements. Each evaluation criteria shall not necessary be given an equal weighting.

### 9 SCHEDULE

9.1 All cables and materials shall be available on or before October 1, 2006.

9.2 Final cut lengths and route details will be provided on March 1, 2006.

### **10 WARRANTY**

The supplier warrants that all equipment shall be in full accordance with this Specification and shall be free of defects in design, material and workmanship and shall warrant same for ten years.

### **11 OWNER ACCEPTANCE**

Final package acceptance will be based the Con Edison PROJECT ENGINEER'S acceptance of the Complete Design Package and Material List.

#### Page 4 of 6

# SECTION II - SERVICE REQUIREMENTS

### **1.0 EQUIPMENT**

All equipment documentations for the designed cable system shall be in accordance with Con Edison Specification CE-TS-4185.

# 2.0 DELIVERY, STORAGE AND HANDLING

All cables and materials shall be available on or before October 1, 2006, and will be shipped to:

Astoria Building #97 31-01 20<sup>th</sup> Street Astoria, NY 11105 Attn: Mr. Alberto Tallini

### **3.0 TESTS AND INSPECTIONS**

For details see latest editions of Specifications AEIC CS7, IEEE-404, IEEE-48 and attached Con Edison's Specifications CE-TS-4185.



Paper copies of the Engineering Operations Manual are uncontrolled and therefore may be outdated. Please verify that you have the current version prior to use by viewing the Central Engineering website (http://ceng/).

Page 5 of 6

# SECTION III - DESIGN REQUIREMENTS AND SUPPLEMENTAL SPECIFICATIONS

## <u>ATTACHMENTS</u>

# CE-TS-4185

# TECHNICAL SPECIFICATION FOR 138-345 KV XLPE INSULATED POWER CABLES AND ASSOCIATED ACCESSORIES

DWG 2005MB2428 MANHOLE DETAILS

DWG 301820

MOUNTING PLATES UPPER AND LOWER FOR 138 KV XLPE OUTDOOR POTHEAD ASSEMBLY AND DETAILES

> EO-14292-D 138 KV STYLE "8" AERIAL LUG FOR POTHEADS

> > <u>DWG 221335</u>

STANDARD POTHEAD STAND SUPPORT DETAILS

<u>DWG 221336</u> STANDARD POTHEAD STAND SUPPORT SECTIONS





# porcelain outdoor termination type OTP-145

voltage class 145kV

page:

date:

3 of 3 18/04/2001



Attachment DPS 9-5

Attachment DPS 9-5



EQUIPMENT STANDARDS

# EQUIPMENT AND FIELD ENGINEERING DEPARTMENT SUBSTATION EQUIPMENT ENGINEERING SPECIFICATION EI-4102-81, REV. 0 SEPTEMBER, 2005

#### PART II

## DETAIL PURCHASE SPECIFICATION FOR OUTDOOR, SHELTERED AISLE, 15 kV, 1500 MVA, METAL-CLAD SWITCHGEAR FOR CEDAR STREET SUBSTATION

### <u>SCOPE</u>

1.00 This detail specification, together with the General Specification EI-4102, Revision 7, cover the requirements for supplying one section of switchgear, bus section 3, for installation at the Cedar Street Substation located at Union Avenue, New Rochelle, New York 10801.

### <u>GENERAL</u>

2.00 The intent of this specification is to supply one section of outdoor, waterproof, sheltered aisle switchgear to include 1500mVA circuit breakers and switchgear. A total of eight (8) 1500mVA, 1200A circuit breakers and four (4) 1500mVA, 4000A circuit breakers and associated internal bus and switchgear shall be supplied.

### **QUANTITY AND RATING**

3.00 The equipment to be supplied shall be in accordance with drawings A217813-MP, 343473-0 and 343474-0 and A217755-11 (attached) and shall be rated 15 kV, 1500 mVA, as follows (paragraphs are as referenced in General Specification EI-4102, Revision 7, Part 1). Construction shall be outdoor, waterproof, sheltered aisle design.

3.01 Item A - Paragraph 12.0 - Two transformer circuit breaker cubicles with removable elements rated 4000 amperes, 1500 mVA.

3.01.1 All new 4000A, 1500mVA circuit breakers shall be interchangeable among all the new sections. These shall be designated as 3TW and 3TE.

3.01.2 Nine current transformers shall be provided, three on bus section side and six on the transformer side. The current transformers on the bus section side and those closest to the transformer shall be rated 3000/5, C400. The current transformers on the transformer side closest to the circuit breaker shall be rated 3000/5 MR, C400 metering accuracy.

3.02 Item B - Paragraph 13.0 - Two bus tie (synchronizing bus) circuit breaker cubicles with removable elements rated 4000 amperes, 1500 mVA.

3.02.1 All new 4000A, 1500mVA circuit breakers shall be interchangeable among all the new sections. These shall be designated as 3SYE and 3SYW.

3.01.2 Six current transformers shall be provided, three on either side of the circuit breaker. These current transformers shall be rated 3000/5, C400.

3.03 Item C - Paragraph 14.0 – Eight (8) distribution feeder circuit breaker cubicles with removable elements rated 1200 amperes, 1500 mVA.

3.03.1 All new 1200A, 1500mVA circuit breakers shall be interchangeable among all the new section. These shall be designated 31E, 31W, 32E, 32W, 33E, 33W, 34E and 34W.

3.03.2 Six current transformers shall be provided, three on either side of the circuit breaker. These current transformers on the feeder side shall be rated 3000/5, C400 and the current transformers on the section side shall be rated 1200/5 MR, C400.

3.04 Item E - Paragraph 16.0 - One miscellaneous equipment cubicles.

3.05 Item F - Paragraph 17.0 – One Potential Transformer cubicles. This shall include the power quality metering.

3.06 Item H - Paragraph 19.0 - Four removable link cubicles with ground studs as indicated on drawing A217813-MP, (attached).

3.07 Item I - Paragraph 20.0 - Two ground and test devices with 1500 mVA interrupting capability.

3.08 Item J - Paragraph 21.0 - Internal buswork as required with the main bus and the feeder bus rated 4000A continuous and capable of withstanding the electrical and mechanical forces associated with fault currents of 63kA symmetrical.

4.00 One spare 4000 ampere and two spare 1200 ampere circuit breaker element. A unit price is required for these items.

5.00 Phasing of the primary stabs shall remain A-B-C left to right when looking into the front of the cubicles.

6.00 The manufacturer shall provide an option for a duplicate line up of switchgear, including spare circuit breakers and spare parts list, for purchase up to the second quarter of 2006.

#### IED'S

7.00 The Protective Relays and other IEDs shall meet CECONY protection requirements and use standard open protocols such as DNP 3.0. Where possible the relays and other IEDs will use LAN based communications and be UCA/ MMS2 compliant.

7.01 The capability of sending and receiving high speed secure messages over the LAN shall be provided. This will be used for:

7.01.1 Relay signaling other relays to capture oscillography of an event

7.01.2 Sending of breaker failure signals

7.01.3 Ultimately this feature may be used to use software changes to implement redesigns, enhancements and upgrades without costly rewiring and hardware changes.

7.02 Future ability of the user to connect over the LAN either from a local GUI or remotely through a Router/Firewall shall be provided. Because of the network environment the user shall access and talk to more than one relay at the same time allowing visual comparison of currents, etc. shall be provided.

7.03 Support for multiple access for different users and functions shall be provided.

7.04 Ability to use any Browser (Netscape, Internet Explorer, etc.) to view present values, fault information, etc. in the relay shall be provided.

7.05 All relays are to be connected to an IRIG B clock to synchronize event times. Synchronization via communications with the data concentrators shall be provided. Synchronization tolerances shall be provided.

### TRAINING

8.00 The supplier shall provide training for the operators, engineers, maintenance and management. The supplier shall provide information on standard system training offered, in addition to product training.

# MISCELLANEOUS REQUIREMENTS

9.00 The manufacturer shall supply physical, elementary and schematic wiring diagrams of the switchgear. All drawings shall be in accordance with Con Edison's Specification EI-4008, latest revision and shall also be supplied on a CD in AutoCAD 14 format.

10.00 The successful bidder shall supply complete instruction books including schematic and wiring diagram and physical outline drawings. Instruction books shall include a detailed maintenance procedure on the new circuit breakers and the switchgear and include specific tests to be performed, which will check all required safety interlocks. The instruction book shall also be supplied on a CD in a PDF format

11.00 The manufacturer shall clearly indicate the foundation tolerances required for the proposed switchgear and whether steel embedded channels are needed.

12.00 The Manufacturer shall advise Con Edison's Construction Department, 48 hours in advance of shipping, the number and weight of the shipping items in order to insure off loading capability.

### EQUIPMENT STANDARDS

## SPECIFICATION EI-4102-81, REV. 0 SEPTEMBER, 2005

13.00 Construction details shall be provided for the Construction Department to evaluate labor requirements equipment installation. Any special rigging requirements are to be clearly indicated.

14.00 An Engineering Manufacturing Schedule shall be provided 1 week after purchase order.

15.00 Maintenance requirements shall be specified in sufficient detail to be evaluated by the Con Edison Maintenance group.

16.00 The protective relays required for the switchgear shall be in accordance with the attached List of Protective Relays and schematic drawings (attached).

17.00 The manufacturer shall state in his proposal the design used to eliminate moisture ingress caused by temperature variations.

18.00 The cubicles shall be capable of supporting the bus and enclosures.

19.00 Removable flexible feeder links and bus links shall be supplied as per the attached one line diagram drawing A217813-MP, attached.

20.00 The switchgear lineups shall be supplied and oriented as per the attached drawing 343473-0.

21.00 The miscellaneous cubicle terminal block arrangement and designations shall be in accordance with Drawing 240701-00, dated 9/24/99.

22.00 All ground studs shall be AB Chance Co. ball grounding studs, Catalog No. C600-2102, with insulating caps, and shall be supplied on the pothead compartment bus and either side of required links.

23.00 Controls and indication shall be provided for both a circuit switcher and a circuit interrupter as per the appropriate plate in the General Specification.

PJD

Patrick Di Lillo Technical Specialist

Attachments:

Drawing A217813-MP Drawing A217755-11 Drawing 343473-0 Drawing 343474-0

SP/08-19-05

One Line Diagram of 138kV and 13kV Connection General Arrangement of 138kV and 13kVEquipment Installation of Switchgear-Plan, Sections and Details Underground Conduit and Trench-Plan and Sections List of Protective Relays Simplified Schematic of Relay Protection sh. 1-4

# LIST OF NEW PROTECTIVE EUQIPMENT FOR CEDAR STREET SUBSTAION PROJECT # 21155-04 (TRANSFORMER #3)

SR. NO.	CATEGORY	PROTECTIVE DEVICE #	QTY.	RELAY TYPE / MODEL #
	,	IED-1/T3 & IED-2/T3	2	G.E. T60-H00-HCH-F8F- H6P-M8F-P6M-UXX-WXX
1	138/13 kV Transformer Protection	51V2/T3 (Transformer vault)	1	ABB Co. Type COV-7, Style # 290B075A11
		51N2/T3 (Transformer vault)	1	Basler Electric Co. BE1- 50/51B-219
2	13 kV Bus	51-51N/3W, 51-51N/3E	2	G.E. F35-H00-HCH-F8F- H6E-M6N-PXX-UXX-WXX
	(2 load buses)	87/3W,87/3E	2	G.E. F35-H00-HCH-F8F- H6E-M6N-PXX-UXX-WXX
2	13 kV Feeders (8 feeders)	IED-1/FDR	8 ·	G.E. F60-H00-HCH-F8F- H6E-M6N-PXX-UXX+WXX
3		IED-2/FDR	8	SCHWEITZER ELECTRIC, SEL0351A00H23554XX
4	Circuit Breaker failure timers (total of 4)	62/3TW, 62/3TE, 62/3SYW, 62/3SYE	4	G.E. SAM201A1A
5	Auxiliary Tripping relays	86/Transformer, Bus	16	ElectroSwitch Co. SR/LOR # 78PM77LA-2
6	Test Switches	As required for IED and 86	relays	ABB Co. Type FT-1
7	Communication Processor			G.E. D20 and SEL-2030
8	GPS Receiver & Antenna			
9	138 kV Feeder Protection (From Cedar St. S/S 10 New Metro Nonh S/S)	50/51/38W09X; 50/51/38W10X	4	Basler Electric Co. BE1- 50/51B-219

Relay Protection Engineering/SP

10/5/2005

# POWER/VAC® VACUUM BREAKERS DESIGNED FOR QUALITY AND SAFETY

# Standardization Means High Quality

A high degree of standardization has been achieved with POWER/VAC breakers. All breakers are the same size, regardless of voltage or interrupting capability. Additionally, most parts of the frame, primary conductors, disconnects and mechanism are interchangeable throughout the breaker product line. This results in a higher quality product and reduces training time for operating and maintenance personnel.



1. Front Panel



2. Primary Disconnect



3. Contact Erosion Indicator

# Interlock System Protects Operating Personnel

For personnel safety, POWER/VAC breakers are designed with a number of mechanical and electrical interlocks. For example, breaker contacts must be open before the breaker can be moved to or from the CONNECT position. A positive mechanical stop is provided when the breaker reaches the CONNECT or TEST/DISCONNECT positions. Mechanical interference interlocks are provided to permit only the insertion of properly rated breakers into any specific compartment. These and other necessary interlocks provide a comprehensive protection system. Furthermore, springs automatically discharge when the breaker is withdrawn from the CONNECT position and breakers cannot be inserted in the closed position. Closed door drawout design also contributes an extra measure of operator protection.

e



#### 4. Interrupter Support



5. Breaker Mechanism



### **Breaker Features**

1. FRONT PANEL: This 11-guage steel front panel fits into a collar-frame in the equipment when the breaker is in the CONNECT position. It provides a metal barrier between the breaker compartment and the secondary device compartment. Well marked and easy-to-read operating controls and indicators include TRIP button, CLOSE button, OPEN/CLOSE indicator, CHARGE/DISCHARGE indicator, OPERA-TIONS counter and provision for manual charging of the breaker.

2. PRIMARY DISCONNECT: The primary disconnect finger set is rugged and easy to inspect. Designed for optimum contact, built of silver-plated copper and tested for continuous and momentary currents, these disconnects provide proper contact integrity throughout the life of the gear for the critical primary disconnect function.

3. CONTACT EROSION INDICATOR: Vacuum interrupter contacts seldom wear out over the normal duty life-span of a circuit breaker. Nevertheless, a contact erosion indicator is provided for inspection convenience. It is visible when the breaker is withdrawn from the compartment.

4. INTERRUPTER SUPPORT: A rugged, high strength, track-resistant polyester glass support assembly firmly positions and holds the interrupter and primary conductors while providing insulation to ground and between phases. This support assembly can be removed quickly by disengaging six bolts. Only a simple alignment of the primary conductors and adjustment of contact wipe is required in the unlikely event that the interrupter assembly needs to be replaced.

**5. BREAKER MECHANISM:** Both ML-17 and ML-18 mechanisms use a spring-charged, stored-energy design that is mechanically and electrically trip-free and can be operated by dc control voltages of 48V, 125V or 250V, or ac voltages of 230V. High quality mechanism parts are precision-tooled for operating consistency, reliability, maintenance ease and long life.

6. ROLL-IN OPTION: A roll-in breaker designed for use in the lower compartment of indoor switchgear is available in all breaker ratings. The roll-in feature eliminates the need for a lift truck and reduces the required front aisle space. Upper compartments may be left blank or used as auxiliary compartments above 1200A and 2000A breakers. Above 3000A breakers, they must be left blank for ventilation. The breaker used for this option is the same as used for the two-high product, with the addition of a simple undercarriage, and can be made interchangeable with existing or new equipment breakers.

7

# THESE SUPERIOR DESIGN FEATURES ARE STANDARD ON POWER/VAC® SWITCHGEAR

A. MAIN BUS COMPARTMENT is completely isolated by metal barriers. Bus bars are provided with high dielectric insulation and pass through track-resistant polyester glass barriers between cubicles. All main bus joints have silver-plated connections for positive contact and low resistance, and are insulated with preformed boots (not shown in this photo). Porcelain insulation to ground is optional.

#### B. SECONDARY DISCONNECTS combine the positive-contact reliability of a plug with the automatic, self-aligning convenlence of sliding-type contacts. While in the test position, secondary contacts are easily disengaged or re-engaged by a linkage operated from the front of the circuit breaker.

C. CURRENT TRANSFORMERS are typically located behind a mechanically actuated safety shutter barrier that isolates the primary disconnects as the breaker is moved into the DISCONNECT position. Two CT's per phase can be accomodated on both the line and load sides of the breaker (as many as 12 CT's per breaker). CT's are frontaccessible after removal of the shutter barrier.

D. VOLTAGE TRANSFORMERS meet all applicable industry standards and are mounted in an easy-access roll-out tray.







#### E. DRY TYPE CONTROL POWER

TRANSFORMERS have molded epoxy resin insulation and are mounted in a draw out tray for easy access. Ratings run through 15kVA single phase. When a higher rating, or 3 CPT's, are required, a fused roll-out tray will be supplied with stationery CPT's mounted in the rear of the unit.

# F. CABLE COMPARTMENT in a

basic two-breaker vertical section has ample space for termination of up to two 750 MCM cables per phase, including stress cone makeup. When only one breaker is required in a vertical section, the entire cable area space is available for use.

in two-high breaker equipment, a vertical steel trough serves as a separation barrier from the other cable compartment. This duct is easily removed to facilitate initial installation of the "inside" cables. When the vertical steel duct is in place, there is still access to the "inside" terminations. The power cable compartment can be arranged to permit both sets of cables to exit below or above.

#### G. PORTABLE BREAKER LIFT is

provided for handling a breaker or roll-out during installation into a compartment, or during removal for inspection or maintenance. Lifts for both indoor and outdoor equipment have interlocks on the lifting forks to lock the breaker in place during transporting.







# THE INSIDE STORY ON ADDITIONAL POWER/VAC® FEATURES

1. Two-High Breaker Stacking can save up to 50% in floor space for most applications, depending on the rating, and results in fewer shipping splits. In addition, cubicle dimensions are the same across all ratings so space requirements are clearly defined at the outset. System planning and layout are thus simplified.

2. Breakers Roll Along Siderails Into Position to assure proper alignment. Positive stops are provided in TEST/DISCONNECT and CONNECT positions. Movement to the CONNECT position is accomplished with a racking mechanism that can be manually, or (as an option) electrically operated from the front of the unit with the door closed.

3. Precision Tooling brings uniform quality to breaker and equipment parts and facilitates trouble-free field assembly and operation.

4. Transformer Roll-Out Trays can be mounted in the top or bottom cubicles for greater flexibility. The transformer primaries are automatically grounded when withdrawn. 5. A Rugged Steel Frame employs reinforced gussets for added strength and dimensional integrity. Seismic-qualified versions are available. Grounded metal barriers isolate all high voltage compartments.

6. Easy Installation results because many foundations that are smooth and level don't require embedded floor steel or grouting. To reduce installation time, equipment can be lifted into place without using skids.

7. Ample Relay and Terminal Block Space accepts complex configurations and is compartmentalized by the front panel enclosing the breaker. Meters, relays, instruments and handles are positioned for easy reading or operation. Open doors are securely held with positive stops so breakers can be inserted and withdrawn without damaging control, indication or protective devices.



#### A Full Selection of Accessories

To facilitate inspection, maintenance and test operations, General Electric offers a full selection of devices and accessories for POWER/VAC metalclad switchgear.

A. OPTIONAL GROUND AND TEST DEVICES are manually or efectrically operated and provide facilities for grounding either the bus side or the outgoing cable side of the metalclad unit, or for "phasing out" operating circuits.

B. TEST CABINET provides a convenlent means to close and trip breakers for maintenance or inspection.

C. OPTIONAL REMOTE RACKING DEVICE is portable and connects to a remote control panel via a 30 foot cable. It is motorized and electrically racks the breaker between the CON-NECT and DISCONNECT positions with the door closed.

D. RACKING HANDLE manually operates the breaker racking mechanism to move the breaker between the CONNECT and TEST/DIS-CONNECT positions.

9

#### Case 05-T-1369 Con Ed Cedar Street Project

#### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-10
Requested By:	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	
Witness:	
Subject:	Engineering Specifications

Provide the bending and pulling specifications for the cable to be used. Is Con Ed going to use cable pulling lubrication? If so, please state what impact the lubricant will have on cable pulling.

### Response to DPS-10:

The cable manufacturer will specify the minimum bending radius and the maximum allowable sidewall pressure. The conductor size determines the maximum allowable pulling tension.

Typically the minimum bending radius for the 138 kV 1500 kcmil conductor planned for this project is seven feet and the typical maximum allowable sidewall pressure is 400 psig. The minimum radius is only allowed at the final cable sweeps into the termination positions. Practically, the duct system is designed for a minimum radius of about 40 feet to navigate around facilities in the roadway and allow for maximum lengths of cable (this eliminates unnecessary joints and increases reliability).

The 1500 kcmil copper conductor will have an allowable pulling tension of 12,000 psig. This number is based upon the EPRI recommended strength of 8 psig per cmil for copper. 1,500,000 cmil x 8 psig/ cmil = 12,00 psig.

Con Edison uses Polywater WJ pulling compound. This compound is used in all solid dielectric cable pulls. A friction factor of .35 is used in calculating the pulling tension. The conservative friction factor for a pull without lubricant is .5. The difference represents a significant reduction in pulling tension in the order of .35 / .5 or a seventy percent reduction in friction. The actual reduction is highly variable because of the relative unknowns in the duct bank construction.

Date of Reply \_\_\_\_\_ December 19, 2005

#### Case 05-T-1369 Con Ed Cedar Street Project

### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-11
<b>Requested By:</b>	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	
Witness:	
Subject:	Engineering Specifications

Provide the engineering specification for the manhole Con Ed will be using for this project.

### Response to DPS-11:

See Attachment DPS-11, a manhole drawings from A.C. Miller Concrete Company. The manhole is designed for ASHTO loading H25 (NYS DOT requirement) with dimensions of 6'-6" H x 5'-10" W x 20'-0" L. The manhole will have two entrances designed to accommodate Con Edison's splicing trailers.

Attachment DPS-11



### Case 05-T-1369 Con Ed Cedar Street Project

### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:DPSRequested By:HetDate of Request:DecReply Date:...Witness:...Subject:Pro

DPS-12 Hebert Joseph, (518) 486-2460 December 12, 2005

Project Costs

Provide a complete breakdown and support information for costs in Table 9.1.1. Include copies of all work papers.

### Response:

See Attachment DPS-12. Please note that Attachment DPS-12 corrects transcription errors in lines 4 and 9 of Table 9.1.1 included in the Cedar Street Project Article VII application.

Name of Respondent \_\_\_\_Bruce Horowitz

Attachment DPS 12

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#### COST FOR CEDAR STREET PROJECT FOR ARTICLE VII APPLICATION

Item	Description	Station Portion (Sheet #1)	Transmission Portion (Sheet #2)	Total Estimated Cost	SEE SUMMARY SHEETS FOR DETAILS
	·····	· · · · · · · · · · · · · · · · · · ·	(*******		
1	Easement and R.O.W Agreements and Surveys	0	0	٥	
2	Material and Supplies	\$377,067	\$4,066,894	\$4,443,961	1
3	Con Edison Labor Lane Survey Chem Lab EC - A/G Elec PST Testing P.M.& I TR Group - TR Assembly Transportation SSO Supervision & Testing ECC Relay Equip.	\$901,508 \$422,880 \$241,200 \$109,629 \$157,653 \$130,872 \$6,500 \$60,032	\$19,500 \$16,000 \$627,120 \$295,200		2
	Station Operator	\$2 030 274	\$10,400	to 000 404	
4	Construction Contracts Civil Fire Det Sys / FP B/G Electrical FDR Work Trench Boring Conduit & MH'S Equip/Matl w/ Con Ed labor group (\$102957+\$15000+\$167000+\$17600+\$30000) SUBTOTAL	\$3,171,664 \$1,474,154 \$362,912 \$332,557 <b>\$5,341,287</b>	\$1,289,563 \$5,589,949 \$2,100,000 \$6,307,423 \$100,000 <b>\$15,386,935</b>	\$20,728,222	3,*
	Transformer 13 Kv Phase Seg Bus PH Stands/Swgr/CSW Fire detection Equip CT's Ret Panels and Misc Relay Equip Wash St SUBTOTAL	\$1,521,100 \$814,875 \$2,834,900 \$293,355 \$200,000 \$33,249 \$5,697,479		\$5,697,479	
6	Other Direct Costs Oil Fill/Permits Environmental & Misc Article 7 Consultant Surveyor/Photo/PE Svc Indep. Test / Abatement SUBTOTAL	\$125,000 \$65,500 \$350,000 \$100,000 \$60,000 \$700,500	\$100,000 \$100,000	\$800,500	5
<u> </u>	Contingency	\$3,882,500	\$5,562,600	\$9,445,100	6
8	Escalation	\$424,200	\$615,700	\$1,039,900	7
9	Overheads and AFDC OH AFDC SUBTOTAL TOTAL ESTIMATED COST	\$3,917,300 \$924,400 \$4,841,700 \$23,295,007	\$5,352,100 \$1,324,600 \$6,676,700 \$33,377,049	\$11,518,400 \$56,672.056	8,*

\* The original submittal dated 10/31/05 contained transcription errors on lines 4 and 9 of Table 9.1.1 which did not effect the bottom line \$56,672, 056 of our original Order of Magnitude Appropriation Estimate.

PROJECT NO21155-04	SHEETL			
BUDGET NO	CENTRAL ENGINEERING	APPROP.	START / /	COMPL / /
ESTIMATE NO. 05-4147-AB-30	ORDER OF MAGNITUDE ESTIMATE	ENG/DES.	START / /	COMPL / /
EST. DATE10/25/2005	TOT REVIEWARA COMMENT	() produty	START / /	COMPL / /
PROJ ENG SHARAD MALLYAN AL		CONSTR.	START 11/14/2005	COMPL . 05/30/2007
PROJ EST ANTHONY BOSCO		PROJECT	IN SERVICE	: 05/30/2007
LOCATION WASHINGTON STREET TO	CEDAR STREET STATION WORK	OUTAGE	IS REQUIRED	
DESCRIPTION 138/13KV TRANSFORMER				

TTPM		COMPA	NY		CONTR	ACT	TOTAL	7.0			
	MHRS	LABOR	\$ EQ/MAT	\$ MHRS	LABOR	S EQ/MATS	DIRECT	JE FSCM	OVERHEAD	DS 20%	ጥርጥል፣
FORCEASED EQUIPMENT								ESCAL	AFDC	CONTIN	IG IOTAL
TRANSFORMER 138/13			1521100	n							
TSKV PHASE SEG BUS			814875				ך 1521100	45600	482300	409800	2458800
PH STANDS/SWGR/CSW	•		2834900	,			814875 /	24400	258400	219500	1317175
FIRE DETECTION EQUIP.			2034900				2834900	\$ 85000.	898600	763700	4593300
CT'S REL. PANELS & MISC.			200000				293355 X	4) 8800	92900	79000	4382200
RELAY EQUIP WASH ST			200000				200000	6000	63400	53900	4/4022
CONSTRUCTION CONTRACTS	· .		33249			•	33249	1000	10500	8900	53649
CIVIL							•			0,00	55045
FIRE DET SYST/FIRE PROT				18813	1953077	1218587	3171664 )_	95100	1005400	954400	
B/G/ELECTRIC				10805	1037845	436309	1474154	3) 44200	467400	307300	5126564
COMPANY LABOR				2973	281654	81258	362912	10900	115000	397200	2382954
EC-A/G ELEC.	1.2000			-				10500	112000	97800	586612
PST TESTING	13/37	901508	)_102957	ک			1004465	30100	4774.00		
P.M.&I.	2280	422880	x 2)				422880	12700	4//100	302300	1813965
TR GROUP-TR ASSEMBLY	3000	241200	[-				241200	7700	208500	128800	772880
TRANSPORTATION	1170	109629	15000	7		•	174670	1200	118900	73500	440800
SSO SUPERVISION & TESTING	1040	157653	167000	(a)			324653	9700	5,8800	37400	224529
E.C.C.	2000	130872	17600	(S)			148472	4500	130600	93000	557953
RELAY EQUIP WASH ST	100	6500	30000	נ	•		36500	4500	70100	44600	267672
MATERIALS AND SUDDE THE	. 896	60032	-				50500	1100	12700	10100	60400
VIMPOTAL							60032	1800	29600	18300	109732
MATERIALS & SUPPLIES			377067								
OTHER DIRECT COSTS			377007				377067	11300	119600	101600	609567
OIL FILL/PERMITS											
ENVIRONMENTAL & MISC						125000 7	125000	3800	39600	33700	
ARTICLE 7 CONSULTANT			65500				<u> </u>	2000	20800	33700	202100
SURVEYOR/PHOTO/PE SRVC						350000.50	5) 350000	10500	111000	1//00	106000
INDEPENDANT TEST/ABATEMENT					-	100000	100000	3000	21600	94300	565800
+				71	6000	54000.	60000	1800	18000	26900	161500
	28429	2030274	6472603	32662	3278576	2366164	14146600	1000	18900	16100	96800
					50,0570	2303134	14140007	424200	4841700 3	882500	23295007
								$\bigcirc$	۷		22 205 205
ORDER OF MAGNITUDE TOTAL-	\$ 23,295,007									SAY <u>a</u>	23,295,007
OVERHEADS 17 12 & CENTRAL ENGLAND	5 ac							_			
ENGINE;	3.76 % A 6	S; 16	.28 🖌 P'F	ROLL TAX	& PENS;						3 917 300
(\$2,523,500)	( \$642	,600 )	(	\$751.200		,	<u> </u>		TOTAL	H'S a 9.	5,517,300
REMARKS						<u> </u>	ŞU )		5.00 % A	FDC =	\$924,400
CENTRAL ENGINEERING	PROJECT	MANAGER	OR USER O	RGANTZAT	TON	CONSTRA			<u> </u>		·
APPROVED BY	ADDDOLO				~ ~1	CONSTRU	UCTION MANAGE	R			
	APPROVE	лы: <u>—</u>				APPROVI	ED BY				1563
	Date				Dat	- Le	<u> </u>	<u> </u>	· · · · · · · · · · · · · · · · · · ·		
Sa.									-	Date	



DUE DATE:	10/05/05	LAST	CREATE/UPDATE	PERFORMED
PROJECT START:		DATE:	10/11/05	
PROJECT END:		TIME	12:06	

DESCRIPTION: WASHINGTON STREET TO CEDAR STREET STATION WORK \*\*\*ORDER OF MAGNITUDE\*\*\* MODELED AFTER GLENDALE 04-4111-AB-00

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PF	BLIMINARY			BSTIMAT	ING SECTION			CBBS.R1	PAGE 2
PR	INT DATE 10/25/05			REPOR	T BY GROUP		OLDEST GRO	EST. NO.: 0 UP UPDATE 05/	5-4147-AB-30 25/04
	GROUP DESCRIPTION	grp Type	MANHOURS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL
	BASIS OF ESTIMATE	COMP	************						**********
	PE: TRANSFORMER 138/13KV	COMP				1521100			
	PE: 13KV PHASE SEG BUS	COMP				1321100			1521100
	PB: CIRCUIT SWITCHERS	Сомр				1022175			814875
	PB: 13KV SWITCHGBAR	COMP				1639750			1032175
	PE: POTHEAD STANDS	COMP				162975			1639750
	CEDAR ST PE: CT'S,REL PANELS &MISC	COMP				200000			102975
	PE: FIRE DETECTION SYSTEM	COMP				293355			200000
	PE:RELAY EQUIP WASH ST	COMP				33249			33249
	CL:RELAY EQUIP WASH ST	COMP	896	60032					60032
	CC:ARTICLE 7 CONSULTANT	CONT					350000	350000	350000
	CCICIVIL	CONT	18813	1953077			1218587	3171664	3171664
XG	CC: B/G BLECTRIC	CONT	2973	281654	1966		79292	362911	362911
XQ	#CL:EC - A/G ELECTRIC	COMP	13737	901508		96746	6211	6211	1004465
XG	#CC:BL INSTL FIRE DET SYST	CONT	8238	806845	19	16878	265412	1072277	1089155
	CC: FIRE PROTECTION	CONT	2567	231000			154000	385000	385000
	CL: PST- TESTING	COMP	5286	422880					422880
	CC: P.M. &I.	COMP	3600	241200					241200
х	CL: TR GROUP -TR ASSEMBLY	COMP	1170	109629		15000			124629
XQ	CL: TRANSPORTATION	COMP	1640	157653		151000	16000	16000	324653
XG	CL:SSO SUPERVIS & TESTING	COMP	2000	130872			17600	17600	148472
	CL: B.C.C.	COMP	100	6500		30000			36500

LEGEND :

- G THE GROUP HAS BEEN FACTORED X DETAIL COSTS HAVE EXPIRED # THE GROUP IS INCOMPLETE

PRELIMINARY PRINT DATE 10/25/05				ESTIMATING SECTION REPORT BY GROUP			CEES.R1 PAGE 3 EST. NO.: 05-4147-AB-30 OLDEST GROUP UPDATE 05/25/04			
	GROUP DESCRIPTION	GRP TYPE	MANHOURS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	
va										
хG	MEST CABLE, CONDUIT * MISC	COMP		16		304797	72271	72271	377083	
	ODC: OIL FILL	CONT					100000	100000	100000	
	ODC:-ENVIR &MISC ITEMS	COMP				65500			65500	
	ODC: ASBESTOS ABATEMENT	CONT	71	6000					05500	
	ODC . DEPKING		/ 1	8000			4000	10000	10000	
	ODCIPERMITS	COMP					25000	25000	25000	
	ODC: INDEPENDANT TESTING	CONT					50000	50000	50000	
	CC:SURVEYOR/PHOTO/PE SRVC	CONT					100000	100000	100000	
								200000	100000	
	COMPANY CONTRACT		28429 32661	2030290 3278576	1985	6360522 16878	137082 2321291	137082 5601852	8527894 5618730	
	** COMPANY TOTAL =	\$8	,544,772	CONTRACT TOTAL	\$5,601,85	52 ESTIMATE	TOTAL =	\$14,146,623	**	
BI	DCHK IF ALL GRPS: COMPANY		28429	2030290			137082	`	2167372	
BI	DCHK IF ALL GRPS: CONTRACT	•	32661	3278576	1985		2321291		5601852	

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EQUIPMENT COSTS FOR COMPANY GROUPS ARE NOT SHOWN ON THIS REPORT, AS THEY DO NOT APPLY. ON THE ESTIMATE SCREENS, THESE COSTS SHOULD BE IGNORED AND SUBTRACTED FROM ALL COMPANY GROUPS.

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PRELIMINARY Print date 10	0/25/05		-	BSTIMAT Repor	ING SECT. T BY GRO	ion Up	OLDES	CRES BST. T GROUP UPD	.R1 PAGE No.: 05-41 ATE 05/25/0	4 47 - AB - 30 4	
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	ROUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
001(10/19/05)	BASIS OF ESTIMATE	******			,			****	****		
	THE BASIS FOR THIS BSTIMATE IS TO INSTALL A 138/13KV TRASNSFORMER AT CEDAR STREET.			·					Ŷ		
	THIS ESTIMATE IS BEING PREPARED FOR ARTICLE VII SUBMITTAL THIS IS AN ORDER OF MAGNITUDE EST WITH THE APPROPRIATION ESTIMATE TO FOLLOW. SCOPE & DRAWINGS WERE PROVIDED.										
******			<b></b>							********	
	COMPANI GROUP SUBICIAL										
010(10/19/05)	PE: TRANSFORMER 138/13KV										
+¥1400000	TRANSFORMER 65MVA, 138/13	1	ls		•		1400000			1400000	
+¥8.65	SALES TAX 8.65	14000	LS				121100			121100	
	COMPANY GROUP SUBTOTAL						1521100			1521100	
011(10/11/05)	PE: 13KV PHASE SEG BUS										
+¥750000	13KV PHASE SEG BUS	1	LOT				750000			750000	
+¥8.65	SALES TAX 8.65	7500	LOT	·			64875			64875	
	COMPANY GROUP SUBTOTAL				0220002		814875	**********		814875	

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				BSTIMATI	NG SECTION			CBBB	<b>21 23</b> CP	5
PRELIMINARY PRINT DATE 10	/25/05			REPORT	BY GROUP		OLDES	EST. T GROUP UPD	NO.: 05-41 ATE 05/25/0	47-AB-30
3202023380623	準민준수차로 드러운 고유 고부 한 한 은 고 문부 전문고 문 문 드				**================					*******
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR BOUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
		******								
012(10/12/05)	PE: CIRCUIT SWITCHERS									
+Y200000	CIRCUIT SWITCHERS Abb	4	BACH			800008			800000	
+Y100000 +Y50000 +Y8.65	CIRCUIT INTERRUPTER SERVICE ENGINEER SALES TAX	1 1 9500	LOT			100000 50000 82175			100000 50000 82175	
	COMPANY GROUP SUBTOTAL					1032175	********		1032175	
013(10/11/05)	PE: 13KV SWITCHGEAR									
+Y1500000	13KV SWITCHGEAR INCLUDING SW GR CUBICLE W/13KV CB MISC CUBICLE DT CUBICLE	1	ls			1500000			1500000	
+¥8.65	SALES TAX 8.65	15000	LS			129750			129750	
+¥10000	ALLOW FOR SERVICE ENGR	1	<b>L8</b>			10000			10000	
30*#3*******				***********						
	COMPANY GROUP SUBTOTAL					1639750			1639750	
014(10/12/05)	PE: POTHEAD STANDS CEDAR ST	:								
+¥75000	PH STANDS	2	BACH			150000			150000	
+¥8.65	SALES TAX	1500	RACH			12975			12975	
0	COMPANY GROUP SUBTOTAL			.*		162975			162975	
017(10/12/05)	PE: CT'S, REL PANELS &MISC									
+¥50000	CT'S	3	LOT			150000			150000	
+¥20000	BU RELAY PANELS	1	lot			20000			20000	

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PRELIMINARY PRINT DATE 10	)/25/05			ESTIMAT Repor	ing sect: T by grot	ion Up		OLDES	CBES EST. IT GROUP UPI	8.R1 PAGE NO.: 05-41 DATE 05/25/0	6 47-AB-3 4
CODE	GROUP/LINE DESCRIPTION	QUAN	r Unit	MANHRS	LABOR	RQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRAC UNI PRIC
017(10/12/05)	PE: CT'S, REL PANELS &MISC	(CONT.)		*********				2242204999			*******
+¥20000	MISC		LOT								
+Y10000	TRANSF METERING	1	LOT				20000		•	20000	
								***********		10000	******
	COMPANY GROUP SUBTOTAL						200000			200000	
)19(06/10/04)	PE: FIRE DETECTION SYSTEM										
	FIRE DET SYSTEM RQUIPMENT SEE GROUP 55 FOR INSTALL										
Y230000	FIRE PROTECTION PANEL ALISON CONTROL INC. A888-M777-10NBEN	1	LOT				230000			230000	
	REMOTE ANNUNCIATOR PANEL A888 WITH DATA LOGGER ALISON CONTROL INC.	1	васн								
	ALSO INCLUDED AS PART OF THE BQUIPMENT FURNISHED BY ALISON CONTROLS ARE THE FOLLOWING ITEMS										
¥40000	2 YEAR GUARANTEE BY MFGR. FOR SERVICE & INSTRUCTION	1	lot				40000			40000	
	HEAT SENSOR CABLE ALISON 9090 - 13 - 400T ALISON 9090 - 13 - 400T	4000	PRET								
	10 - 4"X 4"X 3" HANDY BOX ALISON 2003K - ST1	10	each								
	1300 TYWRAPS-MLT4S.S	1300	BACH								

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PRELIMINARY PRINT DATE 10	0/25/05			ESTIMAT REPOR	ING SECT	ION UP		OLDES	CEES EST. T GROUP UPD	.R1 PAG NO.: 05-4 ATE 05/25/	B 7 147-AB-30 04
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	Company Material	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
019(06/10/04)	PE: FIRE DETECTION SYSTEM	(CONT.)			********		********		***************		
	CLAMPS- ALISON# 171091	1300	васн								
	MANUAL ACTUATE STATION PULL STATION NON CODED	10	BACH								
	MISCELLANEOUS DEVICES FURNISHED FOR XFMRS										
	VALVE TAMPER SWITCHES	10	BACH								
	PRESSURE SWITCHES FOR WATERFLOW	10	BACH								
•	24 VOLT DC SOLENOIDS	10	BACH								
	LOW PRESSURE SWITCH	1	RACH								
	NIBCELLANEOUS DEVICES FOR SMOKE DETECTION SYSTEM										
	SMOKE DETECTORS	40	RACH								
	HORN STROBES	10	BACH								
	MANUAL FIRE ALARM STATION	8	EACH								
+¥8.65	SALBS TAX	,2700					23355			23355	
	COMPANY GROUP SUBTOTAL						293355	******	lûn a sûm çe e	293355	********
021(10/11/05)	PE:RELAY EQUIP WASH ST			•							
+¥1000	50/T GE 12PJC14C7A WITH SHORTING BAR 403A35PI	6	ВХ				6000			6000	
+¥221	AUX/CS GE 12HGA11J52	2	BA				442			442	
+¥5000	87N/T BASLER ELECTRIC BEI -951-E3B1D1U	2	BA .				10000			10000	
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PRELIMINARY PRINT DATE 10	)/25/05			ESTIMAT REPOR	ING SECTION T BY GROUP		OLDES	CEES.R1 PAGE 8 EST. NO.: 05-4147-AB-30 OLDEST GROUP UPDATE 05/25/04		
************			* # # # # #	*********	***********			**********		
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR EQUIPMEN	COMPANY T MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	ONTRA UN PRI
021(10/11/05)	PE:RELAY EQUIP WASH ST (CO)	NT.)	*****	*********		<b>Güzüre</b> gormaz	*********	882982338831	***********	*****
+¥1600	62/T GE SAM 201A1A	2	BA			3200			3200	
+¥2000	86-4/T BLECTROSWITCH CO SR/LOR #7827LG	2	ea			4000			4000	
+¥600	AUX CT KUHLMAN BLECTRIC ACT645 CAT#A1501840(5/5A)	2	BA			1200			1200	
+¥550	AUX CT KUHLMAN BLECTRIC ACT645 CAT#A1503340	2	BA			1100			1100	
+¥200	43/87N/T ABB FT-1 SWITCH	4	ea			800			800	
+¥1000	30/86-4/T P&B R10-T2-W3-J 30 WITH 11 PIN SOCKET	2	BA			2000			2000	
+¥630	30/62/TGE CAT#12NGA99AB001F	2	BA .			1260			1260	
+¥300	RESISTORS	2	EA			600			600	
+¥8.65	SALES TAX	306	LS			2647			2647	
	COMPANY GROUP SUBTOTAL	abbaka				33249			33249	
025(10/12/05)	CL:RELAY EQUIP WASH ST									
H32/67	50/T GE 12PJC14C7A WITH Shorting bar 403a35PI	6	BA	192	12864				12864	
+H32/67	AUX/CS GE 12HGA11J52	2	EA	64	4288				4288	
+H32/67	87N/T BASLER BLECTRIC BEI -951-E3B1D1U	2	EA	64	4288				4288	
H32/67	62/T GE SAM 201ALA	2	BA	64	4288				4288	
H32/67	86-4/T ELECTROSWITCH CO SR/LOR #7827LG	2	BA.	64	4288				4288	

PRELIMINARY				ESTIMA	TING SECT	ION			CEE	5.R1 PA	GE 9
PRINT DATE 10	)/25/05			REPO	RT BY GRO	015		OLDES	T GROUP UPI	DATE 05/25	/04
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
				*******				*********		********	6262328328
+H32/67	AUX CT KUHLMAN BLECTRIC ACT645 CAT#A1501840(5/5A)	NT.) 2	BA	64	4288					4288	
+H32/67	AUX CT KUHLMAN BLECTRIC ACT645 CAT#A1503340	2	Еλ	64	4288					4288	
+H32/67	43/87N/T ABB FT-1 SWITCH	4	BA	128	8576	-				8576	
+H32/67	30/86-4/T PEB R10-T2-W3-J 30 WITH 11 PIN SOCKET	2	RA	64	4288					4288	
+H32/67	30/62/TGB Cat#12NGA99AB001F	2	BA	64	4288					4288	
+H32/67	RESISTORS	2	ea	64	4288					4288	
*******	COMPANY GROUP SUBTOTAL			896	60032		, R = = 4 # # # # 2 3 5 ;	22262262		60032	8823774223
050(10/12/05)	CC:ARTICLE 7 CONSULTANT										
+M350000	ARTICLE 7 CONSULTANT	1	LS					350000	350000	350000	350000.00
	CONTRACT GROUP SUBTOTAL							350000	350000	350000	
051(10/21/05)	CC:CIVIL										
	CEDAR STREET ESTIMATE										
L1598744/104 M949634	FOR CIVIL EST PLEASE SEE EST 05-4147-HY-31 LABOR MATERIAL WASHINGTON STREET CIVIL	1 1		15373	1598744			949634	1598744 949634	1598744 949634	1598744.00 949634.00
	FOR CIVIL EST PLEASE SEE EST 05-4147-HY-32		•								

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PRELIMINARY PRINT DATE 1	0/25/05			estima Repo	TING SECT RT BY GRO	ION UP		OLDES	CEES BST. T GROUP UPI	3.R1 PAC NO.: 05-4 DATE 05/25/	BE 10 147-AB-30 04
CODR	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MÄNHRS	LABOR	ROUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
051(10/21/05)	CC:CIVIL (CONT.)				*********						
+L354333/103 +M268953	LABOR MATERIAL	1 1		3440	354333			268953	354333 268953	354333 268953	354333.00
	CONTRACT GROUP SUBTOTAL			18813	1953077			1218587	3171664	3171664	603386263
053(10/25/05)	CC: B/G ELECTRIC GROUP FACTORS:							1.10			
+M8	NO DISTRIBUTION MANHOLE REQUIRED SOME CONDUIT PREVIOUSLY INSTALLED 6* FRE COND BELOW GRADE CONDUIT, FRE, 6* 6540-6000	1600	FEET					14080	14080	14080	8.80
		1600	FEST	144	14112				14112	14112	8.82
+H.6/98	COUPLING, FRE, 6*6540-6010 COUPLING, FRE, 6*6540-6010	160 160	BACH BACH	96	9408			1408	1408 9408	1408 9408	8.80 58.80
+M120 +H1.5/98	BLBOW, FRE, 90 DEG, 6"X60" BLBOW, FRE, 90 DEG, 6"X60" BLBOW, FRE, 90 DEG, 6"X60"	10 10	BACH BACH	15	1470			1320	1320 1470	1320 1470	132.00 147.00
+H1.5/98	BLBOW, FRE, 45 DEG, 6=X60=	10	BACH BACH	15	1470			935	935 1470	935 1470	93.50 147.00
+M70 +H1.75/98	ELBOW, FRE, 22.5 DEG, 6"X60" ELBOW, FRE, 22.5 DEG, 6"X60"	10 10	BACH BACH	18	1715			770	770 1715	770 1715	77.00
+M40 +H1.75/98	ELBOW, FRE, 11.25 DEG, 6X36 = ELBOW, FRE, 11.25 DEG, 6X36 =	10 10	BACH BACH	18	1715			440	440 1715	440 1715	44.00 171.50
+M60 +H1/98	6" FRE FE ADAPT, CAP &PLUG 6" FRE FE ADAPT, CAP &PLUG	12 12	EACH EACH	12	1176			792	792 1176	792 1176	66.00 98.00
<b>⊧16.90/98/85</b>	COMMUNICATIONS CONDUIT CONDUIT, PVC, UNDER GR, 4	320	FEBT	47	4597			892	5489	5489	17.15
	PRELIMINARY DESIGN ALLOW FOR CONTROL/ PROT										

PRELIMINARY Print date 10	/25/05	ESTIMATING SECTION REPORT BY GROUP							CEES.R1 PAGE 11 EST. NO.: 05-4147-AB-30 OLDEST GROUP UPDATE 05/25/04				
CODE	GROUP/LINE DESCRIPTION	QUANI	T UNIT	MANHRS	LABOR	equipment	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE		
053(10/25/05)	CC; B/G ELECTRIC (CONT.) GROUP FACTORS;				946222621	*****		1.10		1 <b>8 8 9 9 9 9 9 9</b> 9 9 9 9 7	10 3 5 5 5 5 5 5 C		
+10.6/98/85 +13.75/98/85 +16.90/98/85	UNDERGROUND PVC CONDUIT CONDUIT, PVC, UNDER GR, 2 CONDUIT, PVC, UNDER GR, 3 CONDUIT, PVC, UNDER GR, 4	700 620 1100	FERT FBRT FERT	64 74 161	6307 7246 15802			1224 1407 3067	7531 8653 18869	7531 8653 18869	10.76 13.96 17.15		
+H1/98/21 +H1.5/98/64 +H2/98/91	NO DESIGN FOR A/G PACKAGE RGS 90 FROM PVC UG TO AG 2" RGS BLBOW 3"RGS BLBOW 4" RGS BLBOW	22 34 4	BACH BACH BACH	22 51 8	2156 4998 784			508 2394 400	2664 7392 1184	2664 7392 1184	121.10 217.40 296.10		
+M9.39 +M17.78 +M26.38 +H.5/98	2* FE ADAPT, CAP & PLUG 3* FE ADAPT, CAP & PLUG 4* FE ADAPT, CAP & PLUG INSTALL ADAPTERS & PLUGS	16 28 4 48	BACH BACH BACH BACH	24	2352			165 548 116	165 548 116 2352	165 548 116 2352	10.33 19.56 29.02 49.00		
UE0101306500 UE0101310500 UE0121006500 UE0121010500 UE0122006500 UE0122010500 UE0131106500 UE0131110500	CONDUIT, RGS, ON GRADE, 2" CONDUIT, RGS, ON GRADE, 4" CONDUIT BEND, 2" CONDUIT BEND, 4" CONDUIT OFFSET, 2" CONDUIT OFFSET, 4" CONDUIT COUPLING, EXP, 2" CONDUIT COUPLING, EXP, 4"	580 740 18 36 26 40 22 36	*LF *LF *EA *EA *EA *EA *EA	134 296 23 45 31 88 20 46	11828 26120 1987 3974 2756 7773 1747 4038			2966 16406 89 593	14793 42526 1987 3974 2756 7773 1836 4631	14793 42526 1987 3974 2756 7773 1836 4631	25.51 57.47 110.40 105.99 194.33 83.45 128.64		
L150010 UC0120104500 UC0120116800	GENERAL CONDITIONS SUPERVISION- 2MHS/WEEK 2 X 150 = 300 ELECTRICIAN, JOURNEYMAN TRAILER, 8'X26', W/TOILET SANITARY UNIT, TEMP TOILET	300 26 26	*HOUR *WK *WK	300	26367	1612 354			26367 1612 354	26367 1612 354	87.89 62.00 13.60		
+M2.50	ALLOW FOR GROUNDING BASED ON SIMILAR JOB CABLE, BARE, AG, 1/C4/0, 679	2000	FBET					5500	5500	5500	2.75		

PRELIMINARY PRINT DATE 10	CPOUD /LINE			BSTIMAT REPOR	ING SECT T BY GRO	ION UP	CEES.R1 PAGE 12 BST. NO.: 05-4147-AB-30 OLDEST GROUP UPDATE 05/25/04				
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	Equipment	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
053 (10/25/05)	CC: B/G BLECTRIC (CONT.) GROUP FACTORS:	,4820x04			06222588			1.10	*********		5 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
+H.052/98	CABLE, BARE, AG, 1/C4/0, 679	2000	FBET	104	10192				10192	· 10192	5.1
+M3.50 +H.110/98	CABLE, BARE, UG, 1/C500MCM CABLE, BARE, UG, 1/C500MCM	3000 3000	peet Peet	330	32340			11550	11550 32340	11550 323 <b>4</b> 0	3.8 10.7
+M30 +H3.15/98	CADWELD, TA, 750X750X500 CADWELD, TA, 750X750X500	20 20	BACH BACH	63	6174			660	660 6174	660 6174	33.00 308.70
+M15 +H3/98	CADWELD, TA, 500X500X500 CADWELD, TA, 500X500X500	40 40	BACH BACH	120	11760			660	660 11760	660 11760	16.50 294.00
+M14 +H3/98	CADWELD, TA, 500X500X4/0 CADWELD, TA, 500X500X4/0	16 16	each Each	48	4704			246	246 4704	246 4704	15.40 294.00
+M13 +H2.5/98	CADWELD, TA, 4/0X4/0X4/0 CADWELD, TA, 4/0X4/0X4/0	4	each Bach	10	980			57	57 980	57 980	14.30 245.00
+M65 +H1/98	MECH GRD P CLAMP,4/0X4/0 MECH GRD P CLAMP,4/0X4/0	4	BACH BACH	4	392			286	286 392	286 392	71.50 98.00
+M12 +H1.5/98	COIL AND TAPE ENDS ALLOW FOR CORE DRILL THRU EXISTING CONCRETE TRENCHES FOR PVC	68 68	BACH EACH	102	9996			898	898 9996	898 9996	13.20 147.00
+M6 +H2.5/98	CORE DRILL 4"DIA,12"D CORE DRILL 4"DIA,12"D	14 14	RACH RACH	35	3430			92	92 3430	92 3430	6.60 245.00
+M10 +H3/98	CORE DRILL 6"DIA,12"D CORE DRILL 6"DIA,12"D	22	BACH BACH	6	588			22	22 588	22 588	11.00 294.00
+ H2 0 0 / 98	GENERAL CONDITIONS FOR SUBCONTRACTED WORK SUPERVISION-5 MHRS/WEEK 5 & 40 = 200 ELECTRICIAN, JOURNEYMAN	2	LOT	400	39200				39200	39200	19600.00
+M3000	TRAILER, 8'X26', W/TOILET 40 WEERS @ \$75/WEEK	2	LOT					6600	6600	6600	3300.00

PRELIMINARY PRINT DATE 10	PRELIMINARY PRINT DATE 10/25/05			estimat Repoi	TING SECT	ion Up		OLDES.	CEES EST. T GROUP UPD	NO.: 05-41 NO.: 05-41 NTE 05/25/(	13 13 147-AB-30
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
053 (10/25/05)	CC: B/G ELECTRIC (CONT.) GROUP FACTORS:				I 최초국 및 포통 유취 I	******	(就能完善局)的 百 8 2	1.10	프 홈 코 주 다 급 차 유 크 유 K	, 63 42 63 24 14 14 14 16 23 16 23 16	
+M1000	SANITARY UNIT, TEMP TOILET 40 WEEKS @ \$25/WEEK	2	LOT					2200	2200	2200	1100.00
************											
	CONTRACT GROUP SUBTOTAL			2973	281654	1966		79292	362911	362911	
054(10/12/05)	CLIEC - A/G ELECTRIC GROUP FACTORS:				0.75		1.21	1.09			
+H112/98	ASSIST IN RIGGING MAIN TANK ON CENTER LINES, RAD- IATORS & MISC COMPONENTS ELECTRICIAN, JOURNEYMAN UNLOAD/UNCRATE/STORE TRANSE COMPONENTS	ı	HOUR	112	8232					8232	
+H56/98	ELECTRICIAN, JOURNEYMAN	1	HOUR	56	4116					4116	
+H420/98	MECH/ELEC ASSEMBLY, TRANSF ELECTRICIAN, JOURNEYMAN DRYOUT/OILEILLING	1	HOUR	420	30870					30870	
+H336/98	BLECTRICIAN, JOURNEYMAN	1	HOUR	336	24696	•				24696	
	INSTALL INTERRUPTER										
+H48/67	INSTALL INTERRUPTER	1	LS	48	2412					2412	
	INSTALL GRD SWITCH					•					
UE1202102500 UE0951303800 UE0951304500	SUP STRU, AL, GRD SW, 138KV GRD SW, 138KV, 3P, SET UP GRD SW, 138KV, 3P, INSTALL	1 1 1	ra Ra Ba	50 24 80	4105 1955 6543					4105 1955 6543	
UE1202102500 UE0951303500 UE0951304500 UE0953401500 UE0961002500	INSTALL CIRCUIT SWITCHER *SUP STRU,AL,DISC SW,138KV DISC SW,138KV,3P,SET UP DISC SW,138KV,3P,INSTALL MO,DISC SW,138KV/345KV *GROUND SW,138KV,3P	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	ea ea ea ea each	289 96 322 64 280	19117 6366 21313 4765 18568					19117 6366 21313 4765 18568	

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LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

				REPOR	T BY GRO	UP ====aaaaaaa	******	OLDES	T GROUP UPD	ATE 05/25/0	)4
CODE	GROUP/LINE Description	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
	名王氏·王氏·公子王王之法 (2) 二日				******		********				
054 (10/12/05	) CL:EC - A/G ELECTRIC (CONT GROUP FACTORS:	.)			0.75		1.21	1.09			
+¥350 +H48/98	INST PLEX CABLE, 1172MCM BLECTRICIAN, JOURNEYMAN	24 4	BACH HOUR	192	14112		10164			10164 14112	
UE3208510800 UE3208530800 UE3208550800 UE1201102800	POTHRAD STAND BCB, ERECT SCAFF'D, 6M08HR ECB, POTH STD SUPPT, 6M08HR BCB, REM SCAFF'DING, 6M08HR PH STAND, AL, DOUBLE, 138KV	4 4 2	*Set *Set *Set *Bach	192 192 192 108	6674 6674 6674 7173					6674 6674 6674 7173	
+M60 +H48/98	INSTALL TRANSITION BOX *ELECTRICIAN, JOURNEYMAN	2 1	BACH HOUR	64	4692			131	131	131	
L150010	CONTROL CABINETS BLECTRICIAN, JOURNEYMAN	32	+HOUR	32	2366					2366	
+¥250 L150010	INSTALL POTHEAD TERMINAL BOXES & PRESSURE GAUGES BLECTRICIAN, JOURNEYMAN	1 32	LS *HOUR	32	2366		303			303	
L150010 +Y5000	BACK UP RELAY PANEL BLECTRICIAN, JOURNEYMAN EXTEND U/G CONDUIT	48	*HOUR EA	48	3549		12100			3549 12100	
+¥50 +H2/94/20	INSTALL XFMR PULL BOX CUT OPENING	1 16	ls Ra	32	2256		61 387			61 2643	
+H12/98/100 +H32/98/10	Install transition boxes Terminal bl/ ko/ fittgs	1 1	BA Ba	12 32	882 2352		121 12			1003 2364	
+¥18 L150010	INSTALL FLEX CABLES ELECTRICIAN, JOURNEYMAN	18 36	EA +HOUR	36	2662		392			392 2662	
+H60/98/3000	PULL BOX CIRCUIT SWITCHER TERMINAL BL/ KO/ FITTGS	· 1	BA	60	4410		3630			8040	
L150010 UK3208075900 UK3208130800	FO IMUX BLECTRICIAN, JOURNEYMAN MCUT, PULL FO CAB, 24F FO PATCHPANEL, 12PORT	32 700 2	*HOUR *FT *RA	32 56 8	2366 2682 594		737			2366 3419 594	
	RIG IN / ASSEMBLE										

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LEGEND: • - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY PRINT DATE 1		BSTIMATING SECTION REPORT BY GROUP						CEES.R1 PAGE 15 EST. NO.: 05-4147-AB-3( OLDEST GROUP UPDATE 05/25/04				
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE	
054(10/12/05)	CLIEC - A/G ELECTRIC (CONT GROUP FACTORS:	.)			0.75	878988 <b>8</b> 9998	1.21	1.09	88222999888 8822999888			
+H48/98	SWGR SECTS SWGR,13KV, 1-CUB SECTION	9	EACH	432	31752					31752		
+H15/98	INSTALL 13KV PH SEG BUS	270	LF	4050	297675					297675		
+Y5000 UR0904111300 +Y1000	SCAFFALD/LIFTS ETC BUS CONN, SWGRSEC, TO 2000A MISC MTLS	20 1	LS *EACH LOT	322	23894		6050 1210			6050 23894 1210		
+H1/98/62 +H.3/98/6	NO DETAILS TRAY INSTALLATION CONDUIT INSTALLATION	300 1000	ea Ba	300 300	22050 22050		22506 7260			44556 29310		
UE0265320500 UE0265510500 UE0205024500 UE0265220500 UE0265120500 UE0205000500 UE0204014500 UE0264075500	CONTROL CABLE CABLE,7C12,7886/7886C CABLE,19C12,7784C CABLE,600V,12C12,7887C CABLE,4C12,7885C CABLE,2C12,7871/7871C CABLE,600V,1C12,7884C CABLE,600V,2C16,7811C CABLE,14C18,7880C CONNECTIONS	686 800 10800 5000 9860 1200 4200 100	*LP *LF *LF *LF *LF *LF *LF *LF	19 38 454 120 177 13 67 2	1357 2770 33831 9068 13005 989 4847 165		13 19 161 76 67 1 11			1370 2789 33992 9143 13072 990 4858 166		
UE0301108500 UE0301105500 UE0301106500	CONN, 600V, CONTROL, 12 CONN, 600V, CONTROL, 18 CONN, 600V, CONTROL, 16	1500 28 28	*EA *EA *RA	525 8 8	34749 582 582			556 6 6	556 6 6	35305 588 588		
UE0205057500 UE0265820500 UE0265920500 UE0301309500	CABLE, 600V, 2C10, 7890 CABLE, 4C10, 7891C CABLE, 7C10, 7805/7805C CONNECTION, 600V, POWER, 10	1200 600 9860 250	*lf *lf *lf *RA	13 14 306 125	989 1088 22758 9275		886 5 179	534	534	1875 1093 22937 9809		
UE0267620500 UE0267120500 UE0266220500 UE0301318500 UE0301316500 UE0301311500	CABLE, 1C4/0,7894/7894C CABLE, 1C2/0,7893/7893C CABLE, 1C6,7803/7803C CONNECTION,600V,POWER,4/0 *CONNECTION,600V,POWER,2/0 CONNECTION,600V,POWER,6	4800 4000 2400 16 16 8	*LF *LF *LF *EA *EA	202 132 48 16 32 4	15036 9892 3561 1189 2379 297		104 86 17	465 340 17	465 340 17	15140 9978 3578 1654 2719 314		

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VAULT LIGHTING-NO DETAILS

LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

PRELIMINARY Print date 1(	)/25/05		******	<b>ESTIMA</b> Repo	TING SECT RT BY GRO	ION UP		OLDES	CEES EST T GROUP UPI	S.R1 PAG NO.: 05-42 DATE 05/25/0	E 16 147-AB-30 04
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	Company Material	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
054(10/12/05)	CLIEC - A/G BLECTRIC (CONT. GROUP FACTORS:	)			0.75		1.21		*********	CORSCUEDES:	
+Y300 +H12/98 +Y345 +H4/98 UB0811006800 UB081306800 UB0102102500 UB0102102500	FIXTURE, HPS, 100W BLECTRICIAN, JOURNEYMAN FIXTURE, HPS, 100W+BOX&GURD BLECTRICIAN, JOURNEYMAN SWITCH, TOGGLE, 1P15A120V PL, WTTGT, RECEPT/SW, 1G-FS CONDUIT, AL, EXPOSED, .75= CABLE, 1C12, 7156C	4 12 1 4 2 250 1000	HOUR HOUR *RA *RA *LF *LF	144 16 1 40	10584 1176 45 2968 824		1452 417	19 41 445	19 41 445	1452 10584 417 1176 63 63 3413	
+H54/98/1000 IR4001631800 IR4001621800 IR4001661800 IR4001691800 IR4001721800	ALLOW FOR A/G GROUNDS GROUND TRANSFORMER MGRD W/CABLE, SWGR EQ,750 MGRD W/CABLE, SWGR EQ,750 MGRD W/CABLE, DOTHEAD STRU MGRD W/CABLE, BUS DUCT,750 MGRD W/CABLE, DS&STRUC,750	194 664	* DET * DET * DET * DET * DET	54 41 15 89 24 16	3969 3036 1123 6606 1752 1159		1210 4263 1762 2643 2643 1762	310 561 1155 863 762	310 561 1155 863 762	5179 7609 3446 10404 5258 3683	
#15000/98/50 B1814010	OIL WATER SEP SIGNALS WELDER WELDER, 400AMP, 56HP	1 500	*HOUR	77	5625		9075			14700	
+10000/90	SCAPFOLD/ MANLIFT /RENTAL TAGGING -ALLOW	1		67	4500		4840			9340	
L150010 L580730	Blectrician, Journeyman Assist testing MNT4CONST, Blec. Const (ECB)	800	+HOUR +HOUR	800	27810					27810	
L580730	GEN CONDITIONS/ MOB/DEMOB MNT&CONST, BLEC.CONST(ECB) CLEANUP	320	+HOUR	320	11124					11124	
	MATECONST, ELEC. CONST (ECB) OUTAGE COORDINATION MATECONST, ELEC. CONST (ECB)	200 600	=HOUR · +HOUR	200 600	6953 20858		*			6953 20858	
	COMPANY GROUP SUBTOTAL			13737	901508		96746	6211	6211	1004465	, _ c = <b>=  m n s</b>

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PRELIMINARY PRINT DATE 10	/25/05			ESTIMAT REPOR	ING SECTION T BY GROUP		OLDES	CEES EST. T GROUP UPD.	.R1 PAG NO.: 05-4 ATE 05/25/	E 17 147-AB-30 04
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
		******								
055(10/11/05)	CC:EL INSTL FIRE DET SYST GROUP FACTORS:					1.21	1.09			
+500000/98	DELUGE SYSTEM INSTALLATION OF FIRE DETECTION EQUIPMENT WITH ASSOCIATED CONDUIT AND WIRE	1	LS	3061	300000		218000	518000	518000	518000.00
+H64/98	FIRE PROTECTION PANEL NEMA 12	1	EA	64	6272			6272	6272	6272.00
+H64/98	REMOTE ANNUNCIATOR PANEL NEMA 12	1	Ba	64	6272			6272	6272	6272.00
+H.020/98	HEAT SENSOR CABLE TO BE WRAPPED AROUND XFMR	4000	Feet	80	7840			7840	7840	1.96
+H.01/98	TYWRAPS WITH CLAMP	1300	FEET	13	1274			1274	1274	0.98
+H2/98	MANUAL ACTUATE STATION	10	васн	20	1960			1960	1960	196.00
+H2/98	VALVE TAMPER SWITCHES	10	EACH	20	1960			1960	1960	196.00
+H2/98	PRESSURE SWITCHES For Waterflow	10	EACH	20	1960			1960	1960	196.00
+H1/98	24 VOLT DC SOLENOIDS	10	EACH	10	980			980	980	98.00
+H4/98	LOW PRESSURE SWITCH	1	RACH	4	392			392	392	392.00
+H.6/98	1900 BOX AND COVER MISCELLANEOUS DEVICES FOR	90	BACH	54	5292			5292	5292	58.80
+H2/98	SMOKE DETECTION SYSTEM	40	EACH	80	7840			7840	7840	196.00
+H2/98	HORN/STROBE	10	RACH	20	1960			1960	1960	196.00
+H3/98	 MANUAL FIRE ALARM STATION	8	EACH	24	2352			2352	2352	294.00
	, 39 <b>998</b> 888888888888339 <b>336888</b>									

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PRBLIMINARY PRINT DATE 1(	0/25/05			BSTIMA Repo	TING SECT RT BY GRO	ION TP		OLDES	CEE EST T GROUP UP	S.R1 PAG . NO.: 05-4 DATE 05/25/	E 18 147-AB-30 04
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
055(10/11/05)	CC;EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.	)		******	*******	1.21	1.09			CHECQUITS
	ALL CONDUIT, CABLE AND TERMINATION QUANTITIES ARE ESTIMATED AS NO DEFINITIVE INFORMATION IS AVAILABLE CONDUIT AND CABLE RUN BETWEEN XFMR SYSTEMS AND MAIN FIRE PROT PANEL 10 RUNS @ 300 LF EACH										
UE0101202500	CONDUIT, RGS, POWERHSE, .75*	12000	*LP	2292	226874			23246	250120	250120	20.84
UE0264730500 UE0205009500 UE0301107500 UE0301108500	CABLE, 2C14, 7711C CABLE, 600V, 2C12, 7871 CONN, 600V, CONTROL, 14 CONN, 600V, CONTROL, 12	3200 9600 40 120	* Feet * Feet * Bach * Bach	42 154 11 42	4220 14772 1108 4155		2904 9293	9	4220 14772 1117 4200	7124 24065 1117 4200	1.32 1.54 27.93 35.00
	CONDUIT AND CABLE RUNS BETWEEN XFMR DETECTION SYSTEM AND TRANSFORMERS 10 RUNS @ 300 LF BACH										
UE0101202500	CONDUIT, RGS, POWERHSE, .75"	3000	*FBRT	573	56719			5811	62530	62530	20.84
+M.50 +H.025/98 UB0301106800 +M5 +H.75/98	2/C #16STP 2/C #16STP CONN,600V,CONTROL,16 SHIBLDS SHIBLDS	3200 3200 40 10 10	FBBT FBBT *BACH BACH BACH	80 11 8	7840 1108 735			1744 9 55	1744 7840 1117 55 735	1744 7840 1117 55 735	0.55 2.45 27.93 5.45 73.50
	CONDUIT AND CABLE RUN BETWEEN STATION ALARM PANEL AND MAIN FIRE CONTROL PANEL										
UE0101205800	CONDUIT, RGS, POWERHSE, 1.5"	200	*PBET	62	6156			758	6914	6914	34.57
UE0205037800 UE0301108800	CABLE, 600V, 27C12, 497J CONN, 600V, CONTROL, 12	200 54	* Pret * Bach	28 19	2726 1870		2180	20	2726 1890	4906 1890	13.63 35.00

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PRBLIMINARY PRINT DATE 10	/25/05			BSTIMAT RBPOR	ING SECT T BY GRO	ION UP		OLDES	CEES BST. T GROUP UPD	.R1 PAG NO.: 05-42 ATE 05/25/	E 19 147-AB-30 04
CODE	GROUP/LINE DESCRIPTION	QUAN	UNIT	NANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	Contract Total	TOTAL	CONTRACT UNIT PRICE
055(10/11/05)	CC: EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.)			*******		1.21	1.09		548865555 5	
	CONDUIT AND CABLE RUNB BETWEEN STATION ALARM PANEL AND MAIN FIRE ALARM CONTROL PANEL										
UE0101202500	CONDUIT, RGS, POWERHSE, .75"	150	*LF	29	2836			291	3127	3127	20.84
UE0205009800 UE0301108800	CABLE, 600V, 2C12, 7871 CONN, 600V, CONTROL, 12	340 8	*LF *BA	5 3	.523 277		329	3	523 280	852 280	1.54 35.00
	CONDUIT AND CABLE RUNS BETWEEN LOW CITY WATER PRESSURE SWITCH AND MAIN FIRE ALARM CONTROL PANEL							· .			
UE0101202500	CONDUIT, RGS, POWERHSE, .75*	200	*FRET	38	3781			387	4169	4169	20.84
UR0264730800 UR0301107500	CABLE, 2C14, 7711C CONN, 600V, CONTROL, 14	220 4	*FEET *Bach	3 1	290 111		200	1	290 112	490 112	1.32 27.93
UE0101202800	CONDUIT AND CABLE RUNS BETWEEN REMOTE ANNUNCIATR PANEL & MAIN CONT'L PANEL CONDUIT, RGS, POWERHSE, .75	150	*FERT	29	2836			291	3127	3127	20.84
+M.5 +H.025/98 UB0301106900 +M5	2/C #16 STP 2/C #16 STP CONN,600V,CONTROL,16 SHIBLDS	170 170 4 1	FEET BACH BACH BACH	4	417 111			93 1 5	93 417 112 5 74	93 417 112 5 74	0.55 2.45 27.93 5.45 73 50
+11.75756	AC AND DC POWER FEEDERS TO MAIN FIRE CONTROL PANEL		<b>B</b> ACH	•	/ •				, 1		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
UE0101202800	CONDUIT, RGS, POWERHSE, .75 CONDUIT AND CABLE RUNS BETWEEN FIRE PUMP CONTROLLER AND PUMP STARTER TO MAIN FIRE	400	*FBET	76 ·	7562			775	8337	8337	20.84

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LEGEND: \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

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PRELIMINARY PRINT DATE 1	0/25/05			BSTIMA Repoi	TING SECT RT BY GRO	TION		OLDES	CEES EST. T GROUP UPD	.R1 PAC NO.: 05-4 ATE 05/25/	3E 20 1147-AB-30 /04
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
055(10/11/05)	CC:BL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.	)		****	****	1.21	1.09		9388645595	
1180101202900	CONTROL PANEL										
UE0204054500 UE0301107500	CABLE, 600V, 1C14, 7155C CONN, 600V, CONTROL, 14	250 2500 20	*FBET *LP *BACH	48 28	4727 2748		242	484	5211 2748	5211 2990	20.84
	CONDUIT AND CABLE RUNS FOR FIRE ALARM MANUAL STATIONS TO MAIN FIRE CONTROL PANEL			Ū				5	227	559	27.93
UK0101202500	CONDUIT, RGS, POWERHSE, .75*	400	*LF	76	7562			775	8337	8337	20.84
UE0264730800 UE0301107800	CABLE, 2C14, 7711C CONN, 600V, CONTROL, 14	1000 40	*lf *ea	13 11	1319 1108		908	9	1319 1117	2226 1117	1.32
	CONDUIT AND CABLE RUNS FOR AUDIBLE/VISUAL ALARMS HORNS AND STROBES TO MAIN FIRE CONTROL PANEL										
<b>UE0101202500</b>	CONDUIT, RGS, POWERHSE, .75"	800	*LF	153	15125			1550	16675	16675	20.84
UE0205009500 UE0301108500	CABLE, 600V, 2C12, 7871 CONN, 600V, CONTROL, 12	850 40	*lf *ba	14 14	1308 1385		823	15	1308 1400	2131 1400	1.54 35.00
	CONDUIT AND CABLE RUNS FOR SMOKE DETECTORS TO MAIN FIRE CONTROL PANEL										
UR0101202800	CONDUIT, RGS, POWERHSE, .75*	1250	*LF	239	23633			2421	26054	26054	20.84
+M.6 +H.018/98 +H.33/98	FIRE ALARM CABLE FIRE ALARM CABLE FA CABLE TERMINATIONS	1500 2500 60	Fert	45 20	4410 1940			981	981 4410 1940	981 4410 1940	0.65 1.76 32.34
+H200/98	LOST TIME DUE TO PERIODS OF OUTAGES	1		200	19600				19600	19600	19600.00
+H4/98/100	ALLOW FOR PENETRATIONS	20		80	7840			2180	10020	10020	501.00

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PRELIMINARY PRINT DATE 10	0/25/05			BSTIMA) Repon	TING SECT: RT BY GROI	ion Up		OLDES	CEE EST T GROUP UP	9.R1 PAG . NO.: 05-4 DATE 05/25/	9E 21 147-AB-30 04
	GROUP/LINE DRSCRIPTION	QUANT	UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT	CONTRACT	TOTAL	CONTRACT UNIT PRICE
055(10/11/05)	CC:EL INSTL FIRE DET SYST GROUP FACTORS:	(CONT.)					1.21	1.09			866533388
+L98/98 UC0110101500 UC0110115500 +L4000 +M5000	GEN CONDITIONS MOB/DEMOB CLEANUP,1 MHR/DAY CLEANUP,FINAL HASP SCAFF/LIFTS EQ RENTALS	96 120 1 1 1	*DAY *DAY	96 132 20	9408 9330 1393	19		5450	9408 9330 1412 5450	9408 9330 1412 5450	98.00 77.75 1412.23 5450.00
				2020-4878 8738	806845	10				1000155	822566623
102(10/25/05)	CC: FIRE PROTECTION					19	100/0	703412	10/22//	1089133	
+135000/90 +150000/90 +100000/90	A/G FIRE FOR TRANSFORMERS RING PIPING/ SPRAY NOZZLE HEADER PIPING & MODS FIRE PUMP & ASSOC EQUIP	1 1 1	bank bank bank	900 1000 667	81000 90000 60000			54000 60000 40000	135000 150000 100000	135000 150000 100000	135000.00 150000.00 100000.00
	CONTRACT GROUP SUBTOTAL		8 H Q H Q Q	2567	231000		9979999999	154000	385000	385000	
130(10/12/05)	CL: PST- TESTING			•							
+H5286/80	S&TO, PROT SYS TEST (PST)	1	LS	5286	422880		· ·			422880	
		*******			### <b>%</b> #################################		**********			*********	********
	COMPANY GROUP SUBTOTAL			5286	422880					422880	
132(10/08/04)	CC: P.M. &I.										
+L67/67	PM & I. 30 WEEKS @ 40 HOURS/WEEK X 3 MKN	3600	HOUR	3600	241200				*******	241200	c = c = # c = #
	COMPANY GROUP SUBTOTAL			3600	241200					241200	

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PRELIMINARY Print date 10	0/25/05			<b>ESTIMA</b> Repo	TING SECT ORT BY GRO	ion Up		OLDES	CEES EST. T GROUP UPD	.R1 PAGE NO.: 05-41 ATE 05/25/0	22 47-AB-30
CODB	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	RQUIPMENT	Company Material	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
150(06/22/04)	CL: TR GROUP -TR ASSEMBLY	6 20 40 40 40 40 10 10 10 10 10 10 10 10 10 10 10 10 10	# 4 <b>8 R</b> 14 H A		********	Rex Raakha sa	*******	*****	*****		
L150010	ASSIST IN RIGGING MAIN TANK ON CENTER LINES, RAD- IATORS & MISC COMPONENTS ELECTRICIAN, JOURNEYMAN	450	*HOUR	450	42165					42165	
L150010	UNLOAD/UNCRATE/BTORE TRANSF COMPONENTS ELECTRICIAN, JOURNEYMAN	90	+HOUR	90	8433					8433	
L150010 +¥15000	OIL FILL/DRYOUT BLECTRICIAN, JOURNEYMAN PETRONOL RIG RENTAL	630 1	*HOUR LOT	630	59031		15000			59031 15000	
	COMPANY GROUP SUBTOTAL		******	1170	109629.	12222222222	15000	43,52 H = = # = #		124629	
212(10/11/05)	CL: TRANSPORTATION GROUP FACTORS:				1.53						
L580390	TRANSP. OPRERATIONS RIG TRANSFORMER(13KV) AND RIG RADIATORS RIG OIL PUMP & PIPING RIG XPANSION TANK+ PIPING RIG LV/HV/NEUT BUSHINGS AND REACTOR RIG BUSHING POTENT DEVICE RIG CIRC SW RIG POTHEADS DISC SW/ OH BUS SW GR & OTHER	1640 1	*HOUR EACH	1640	· 157653					157653	·
+Y50000 +Y7000 +Y20000 +Y55000 +Y9000 +Y10000	TRAILER RENTAL, 13 AXLE NYPD ESCORT BARGE RENTAL CRAME SUPPORT (500 TON) WELSBACH ELECTRIC INDEPENDENT ENGRG ANAL	1 1 1 1 1	LS LS LS LS LS				50000 7000 20000 55000 9000 10000			50000 7000 20000 55000 9000 10000	
+N16000	\$ ALREADY SPENT ON	1	LS					16000	16000	16000	

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PRELIMINARY PRINT DATE 10	0/25/05			estimat Repor	TING SECT	(ON JP		OLDES	CEES BST. T GROUP UPD	.R1 PAGE NO.: 05-41 ATE 05/25/0	23 47-AB-30 4
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
212(10/11/05)	CL: TRANSPORTATION (CONT.) GROUP FACTORS:	9946364	72922		1.53		) 특석 차 코 및 물 과 것 은 공 ·		6233883886	# # t 3 8 # 3 5 5 5 5	
*****	TRANSPORTATION										
	COMPANY GROUP SUBTOTAL			1640	157653		151000	16000	16000	324653	********
283(10/14/04)	CLISSO SUPERVIS & TESTING GROUP FACTORS:				1.23						
L580320	1.5 OPERATOR 3 MONTHS 12 HR/DAY, 6DAY 8&TO,CEN.SUBST.NO (CSD-N)	2000	*HOUR	2000	130872					130872	
+M17600	ALREADY SPENT ON TESTING	1	LS					17600	17600	17600	
- C D = # H D # H D T D H D #	COMPANY GROUP SUBTOTAL	6 3 3 3 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	CHUREN:	2000	130872	********		17600	17600	148472	38567858
286(06/09/04)	CL: B.C.C.										
+¥30000	MODIFY MIMIC BOARD MISC LABOR, REPROGRAM SOCC	1					30000			30000	
+L65/65	BCB	100	HOUR	100	6500					6500	
	COMPANY GROUP SUBTOTAL			100	6500		30000		: # # # # # # # # # # <b>#</b> = = :	36500	0 a 3 <b>4 4 6 8 8</b>
300(10/12/05)	M&S: CABLE, CONDUIT * MISC GROUP FACTORS:			0.01	0.01	0.01	1.21	1.21			
UE0265320500 UE0265510500 UE0205024500 UE0265220500 UE0265120500 UE0205000500	CABLE *CABLE,7C12,7886/7886C *CABLE,19C12,7784C *CABLE,600V,12C12,7887C *CABLE,4C12,7885C *CABLE,2C12,7871/7871C *CABLE,600V,1C12,7884C	686 800 10800 5000 9860 1200	LF LF LF LF LF		512		1324 1936 16074 7563 6741 102			1324 1936 16078 7564 6743 102	

LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS

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PRELIMINARY PRINT DATE 1	0/25/05			BSTIMAT REPOR	ING SECT T BY GRO	ION UP		OLDES	CEE EST T GROUP UP	S.R1 PA NO.: 05- DATE 05/25	3E 24 4147-AB-30 /04
	GROUP/LINE						COMPANY	CONTRACT	CONTRACT		CONTRACT
CODE	DESCRIPTION	QUANI	ONIT	MANHRS	LABOR	BOUIPMENT	MATERIAL	MATERIAL	TOTAL	TOTAL	PRICE
	구경에 문학은 고 다 프로프 다 다 다 다 다 드 가 더 더 다 다 드 프로 프로 드							*********	***********		*********
300(10/12/05	) M&S: CABLE, CONDUIT * MISC GROUP FACTORS:	(CONT.)		0.01	0.01	0.01	1.21	1.21			
UE0204014500	*CABLE,600V,2C16,7811C	4200	*LF		1		1118			1119	
UE0205057500	*CABLE,14C18,7880C *CABLE,600V,2C10,7890	100 1200	+LF +LF				96 886			96	
UB0265820900	*CABLB, 4C10, 7891C	600	*LF				486			487	
080203920300	-CABLE, /CIU, /805//805C	9860	*LF		3		17896			17899	
UE0267620800 UE0267120800	*CABLE,1C4/0,7894/7894C *CABLE,1C2/0,7893/7893C	4800	*LF *LF		2		10425			10427	
UB0266220800	*CABLE,1C6,7803/7803C	2400	*LF		1		1684			8568	
+100000	OTHER MISC	1					121000			121000	
	ADD	_									
+M35500	SPENT ON CABLE & COND.	6 1	LS LS				108900	42955	42955	108900	
+M24228	S SPENT ON WIRE ROPE	ī	LS					29316	29316	29316	
			*****			*******	월 ở ở ở ở ở ở 두 두 두 <sup>5</sup> 년		**********		********
	COMPANY GROUP SUBTOTAL				16		304797	72271	72271	377083	
510(05/25/04)	ODC: OIL FILL										
+M100000	OIL FILL	1	LOT					100000	100000	100000	100000.00
0.00										<b>UQX0683</b> 033	**********
	CONTRACT GROUF SUBTOTAL							100000	100000	100000	
540(10/11/05)	ODC:-ENVIR &MISC ITEMS										
+ 1 0 0 0 0		-	T 07				10000			10000	
+110000	AIR TESTING	1	LOT				10000			10000	
+¥1000	X-RAY SERVICE	1	LOT				1000			1000	
	CO FACILITIES										
+1500	TRAILER W/TLT, 8X21, MONTHS	13	MO				6500			6500	
		13	-10				0.500			0500	
	RUBBISH REMOVAL SERVICE										

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LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MRASURE) THE LINE HAS EXPIRED COSTS

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PRELIMINARY PRINT DATE 1	0/25/05			ESTIMATI REPORT	ING SECT BY GRO	ION UP		OLDES	CRE: BST T GROUP UPI	9.R1 PA NO.: 05- DATE 05/25	GE 25 4147-AB-30 /04
CODB	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	RQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
9#####################################											
540(10/11/05)	ODC:-ENVIR &MISC ITEMS (CON	NT.)									
+¥500	DEBRIS CONTAINER, 30CY	13	PROP				6500			6500	
+¥5000	GASES/AIR/PROPANE ETC	1	LOT				5000			5000	
+¥20000	GUARD SERVICE	1	LS				20000			20000	
	COMPANY GROUP SUBTOTAL			8988938226	acosc <u>a</u> t:	* 4 4 9 2 2 2 2 2 2 2 2 2	65500			65500	
548(10/12/05)	ODC:ASBESTOS ABATEMENT										
+10000/85	ALLOW FOR ASBESTOS ABATEMENT	1	LS	71	6000			4000	10000	10000	10000.00
	CONTRACT GROUP SUBTOTAL				6000	(승프레 보드박유명 북주)	■■■≈≈	4000	10000	10000	902023230
50(10/21/05)	ODC: PERMITS										
M25000	PERMITS	1	LS				-	25000	25000	25000	
	COMPANY GROUP SUBTOTAL			14020602051	*******	문부전 걸 두 두 두 전 두 급 s	********	25000	25000	25000	GI <b>H</b> 482030
55(10/21/05)	ODC: INDEPENDANT TESTING										
M50000	INDEPENDANT TESTING	1	LS					50000	50000	50000	50000.00
	CONTRACT GROUP SUBTOTAL		*****	1 = 7 7 2 2 2 2 3 4 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	********	**********	*********	50000	50000	50000	
60(10/21/05)	CC:SURVEYOR/PHOTO/PE SRVC										
M100000	SURVEYOR/PHOTO/PE SRVC	1	LS					100000	100000	100000	100000.00
	CONTRACT GROUP SUBTOTAL	420123		stondadian	· 정말 는 의 번 것 것 :	26212222222	520308×±±;;;	100000	100000	100000	10#940223

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PRELIMINARY PRINT DATE 10	/25/05			ESTIMATII REPORT	NG SECTION BY GROUP		OLDES	CEB BST T GROUP UP)	S.R1 PAC . NO.: 05-4 DATE 05/25/	3B 26 1147-AB-30 /04
CODE	GROUP/LINE DESCRIPTION	QUANT	ŪNIT	MANHRS	LABOR BOUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE

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\*\* END OF ESTIMATE REPORT \*\*

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PROJECT NO21155-04	SHEET 2
BUDGET NO	CENTRAL ENGINEERING
ESTIMATE NO05-4147-AB-00	ORDER OF MAGNITUDE ESTIMATE

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APPROP.	START	/	/	COMPL	-	/	/
ENG/DES.	START	1	1	COMPL		1	/
PROCUR	START	1	1	COMPL		1	1
CONSTR.	START :	11/1	4/2005	COMPL		05/3	0/2007
PROJECT	IN SER	VICE	• • • • • • •	:	05	5/30/	2007
OUTAGE	TO DEO		n			• •	

B PROJ ENG .... SHARAD MALLYA H

PROJ EST. ... ANTHONY BOSCO BH

EST. DATE....10/25/2005

# LOCATION ..... WASHINGTON STREET TO CEDAR STREET ONE FEEDER

## DESCRIPTION... 138RV SOLID DIELECTRIC CABLE

7 60 00 4		COMPAN	Y		CONTRA	CT	TOTAL	79	OUTROLICAT		
CONSTRUCTION CONTRACTOR	MHRS	LABOR\$	EQ/MAT\$	MHRS	LABOR\$	EQ/MAT\$	DIRECT	ESCAL	& AFDC	CONTINC	TOTAL
FDR WORK TRENCH BORING CONDUITS & MH'S COMPANY LABOR				11745 37811 14824 37082	1272274 3849431 1260000 4050375	17289 1740518 840000 2257048	1289563 5589949 2100000 6307423	38700 167700 63000 189200	408900 1772100 665700 1999600	347400 1505900 565700 1699200	2084563 9035649 3394400 10195423
LANE SURVEY CHEM LAB TRANSPORTATION P.M.&I. STATION OPERATOR MATERIALS AND SUPPLIES	300 200 3600 9360 . 160	19500 16000 295200 627120 10400	D 100,000	۹			19500 16000 395200 627120 10400	600 500 11900 18800 300	9600 8000 177300 309300 5300	5900 4900 116900 191000 3200	35600 29400 701300 1146220 19200
MATERIALS & SUPPLIES OTHER DIRECT COSTS			4066894				4066894 🛈	122000	1289300	1095600	6573794
ENV TESTING	13620					100000	100000	3000	31600	26900	161500
· · ·	13620	568220	4166894 ]	101462	10432080	4954855	20522049	615700	6676700 B	5562600	33377049
										JAI 4	33,311,043

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ORDER OF MAGNITUDE TOTAL-\$ 33,377,049

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OVERHEADS	17.32 % CENTRAL ENGINE:	3 75 8 3 5 5	16 20 0		· · · · ·			
	( \$3,661,100)	1 ( CD20 EDA )	10.25 3	P'ROLL TAX & PENS			TOTAL OH'S =	\$5,352,100
REMARKS	( 00)001,100 /	1 \$932,500 )	(	\$758,500 )	<u> </u>	\$0 }	5.00 % AFDC =	\$1,324,600

CENTRAL ENGINEERING PROJECT MANAGER OR USER ORGANIZATION CONSTRUCTION MANAGER APPROVED BY . APPROVED BY APPROVED BY 2238 Date ...: Date Date

> S. 1.1 ...-

#### PRELIMINARY PRINT DATE 12/15/05

#### ESTIMATING SECTION

# CBES.R1 PAGE 1 BST, NO.: 05-4147-AB-00

REPORT BY GROUP .... 

BSTIMATE NO.: 05-4147-AB-00 SPONS . ENGR : SHARAD MALLYA CHECKED/SIGNED: PROJECT NO.: 21155-04 SUPERVISOR: ... GEORGE HERSKOWITZ . 1. BUDGET NO.: BSTIMATOR: BOSCO ANTHONY 2. LOCATION NO. : WASH SECTION: 384 : :: ACCOUNT NO. : DISCIPLINE: ELEC. SUPPORTING: CIVIL CC #:

DUE DATE:	10/05/05	LAST CREATE/UPDATE PERFORMED
PROJECT START:	05/01/06	DATE: 10/11/05
PROJECT END:	05/01/07	TIME: 12:00

DESCRIPTION: 138 KV SOLID DIELCTRIC CABLE FROM WASHINGTON STREET TO CEDAR STREET TR#3, ONE PDR \*\*\*ORDER OF MAGNITUDE\*\*\*



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PRI PRI	ELIMINARY INT DATE 12/15/05			ESTIMATING REPORT E	G SECTION BY GROUP		OLDEST G	CEES.R1 EST. NO.: C COUP UPDATE 10/	PAGE 2 05-4147-AB-00 27/05
	GROUP DESCRIPTION	GRP TYPE	MANHOURS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL
	BASIS OF ESTIMATE	COMP		===============================			**********	=======================================	
XG	CC:FEEDER WORK	CONT	11745	1272274			17289	1289563	1289562
	M&S:138KV CABLE & ASSOC.	COMP				4066894	2,205	120000	4066894
XG	CC:TRENCHING	CONT	37811	3849431	382274		1358244	5589949	5589949
	CC:BORING	CONT	14824	1260000			840000	210000	3100000
XG	CC:CONDUIT/ MH INSTALL	CONT	37082	4050375	313	7240	2249495	6300184	5307424
	CL:LANE SURVEY	COMP	300	19500			2012175	0000104	19507
	CL:CHEM LAB	COMP	200	16000					19300
	CL:TRANSPORTATION DEPT.	COMP	3600	295200		100000			285200
	CL:P.M. &I	COMP	9360	627120		200000			535200
	CL:STATION OPERATOR	COMP	160	10400					627120
	ODC:ENV TESTING/TEST PITS	CONT					100000	100000	10400
	COMP <b>ANY</b> CONTRAC	====. T	13620 101461	968220 10432080	382587	4166894 7240	4565028	15379696	5135114 15386936
	** COMPANY TOTAL =	Ş	5,142,354	CONTRACT TOTAL =	\$15,379,698	5 ESTIMATE	TOTAL =	\$20,522,050	* *
BI	DCHK IF ALL GRPS: COMPANY		13620	968220					9 <b>682</b> 20
BII	DCHK IF ALL GRPS: CONTRAC	т	101461	10432080	382587		4565028		15379696

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EQUIPMENT COSTS FOR COMPANY GROUPS ARE NOT SHOWN ON THIS REPORT, AS THEY DO NOT APPLY. ON THE ESTIMATE SCREENS, THESE COSTS SHOULD BE IGNORED AND SUBTRACTED FROM ALL COMPANY GROUPS.

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LEGEND:

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G - THE GROUP HAS BEEN FACTORED X - DETAIL COSTS HAVE EXPIRED

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PRELIMINARY PRINT DATE 12	2/15/05		estima Repo	TING SECTION RT BY GROUP		OLDRS	CEES BST. T GROUP UPD	.R1 PAG NO.: 05-4 ATE 10/27,	3B 3 1147-AB-00 /05
CODE	GROUP/LINE DESCRIPTION	QUANT UNIT	Manhrs	LABOR EQUIPMENT	COMPANY MATBRIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE
001(11/01/05)	BASIS OF ESTIMATE			2 4 5 5 5 5 5 3 2 2 0 4 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		美非常美的 医足管 化	NGSESIGISCH	× = 3 1 6 2 2 × 4 1	
	THE BASIS FOR THIS ESTIMATE IS TO INSTALL A SOLID DIELECTRIC FDR FROM WASHINGTON ST TO CEDAR ST THE TA WORK FOR THE POTHEAD STAND IS NOT PART OF THIS EST AS PER ENGINEER.			:					
	THIS ESTIMATE IS BEING PREPARED FOR ARTICLE VII SUBMITTAL THIS IS AN ORDER OF MAGNITUDE EST WITH THE APPROPRIATION ESTIMATE TO FOLLOW.	• • •		ж					
**********	PROVIDED.								
	COMPANY GROUP SUBTOTAL								9 kozes 2 ke
041(10/28/05)	CC:FEEDER WORK GROUP FACTORS:			1.52					
IE3202430500 IE3202010500	PULL 138KV POTHEADS,W/SI POTHEAD SPLICES,138KV	2 *SET 2 *SET	280 712	270 <b>54</b> 67099			27054 67099	27054 67099	13526.78 33549.60
L580770	SETO, UNDERGR TRANSM (U.T)	200 *HOUR	200	19413			19413	19413	97.07
L580770	INSTALL I.D. TAGS S&TO, UNDERGR TRANSM (U.T)	60 *HOUR	60	5824			5824	5824	. 97.07
L580770	TAPE COAT JOINTS S&TO, UNDERGR TRANSM (U.T)	80 *HOUR	80	7765			7765	7765	97.07
IE3202710500 IE3202720500	COMMUNICATION CABLING COMMUNICATION CBL, INSTALL COMMUNICATION CBL, SPLICB	18 *SECT 18 *SECT	1444 829	140198 80456			140198 80456	140198 80456	7788.77 4469.77
183201810500 *	SPLICE, NORMAL, 138KV	9 *BA	3619	356200			356200	356200	39577.73
				a destructions and a second					

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 LEGEND: \* - (BEFORE DESCRIPTION) THE LINE HAS BEEN FACTORED \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS



PRELIMINARY PRINT DATE 12	2/15/05		,	estima Repo	TING SECT	Ion TP		OLDES	CBE: BST T GROUP UP!	3.R1 PAG NO.: 05-4 DATE 10/27/	В 4 147-ав-00 05
CODB	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	BQUIPMENT	. COMPANY MATBRIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
041(10/28/05)	CC:FEEDER WORK (CONT.) GROUP FACTORS:		• <b>••</b> •• •• •• •• •• •		1.52			Gerandêsis			
IE3202230500 IE3201500500 UE0311407500 UE0207032500 UE0208021500 UE0301325500 +L108/108	PULL 138KV CABL, WESTCH/SI ID FEEDERS WITH TAGS CADWELD, SS, 4/0X4/0 CABLE, 600V, 1C4/0, 417J CABLE, 600V, 1C500, 419J CONNECTION, 600V, POWER, 500 16 SURGE ARRESTORS AND BOXES	9 72 280 15500 114 160	*SECT *SECT *EA LF LF BA HRS	2646 36 50 16 1442 171 160	261158 3494 8318 2562 238274 28193 26266	· · ·		605 6684	261158 3494 8924 2562 238274 34877 26266	261158 3494 8924 2562 238274 34877 26266	29017.55 388.27 123.94 9.15 15.37 305.93 164.16
+M10000	MISC MAT'LS	1	ls					10000	10000	10000	10000.00
************	CONTRACT GROUP SUBTOTAL	*******		11745				17289	1289563	1289563	42277622
061(10/28/05)	M&S:138KV CABLE & ASSOC.						•			2009505	
+¥30 +¥.4 +¥7500 +¥10000	138KV SOLID DIELECTRIC SPACER ASSEMBLY 138KV SINGLE PHASE JOINTS 138 KV SOLID DIELECTRIC	51150 15440 27 9	lf Lf Ba Ba				1534500 6176 202500 90000			1534500 6176 202500 90000	
+¥74 +¥7 +¥6000 +¥4	DEATE 2'6" X 4' 3/8" CONDUIT FRE 6" W/FITTINGS BARKSDALE PRESSURE SWITCH HDPE 4" GROUND CONDULT	3560 124000 2 31000	PLTS LF BA LF			· ·	263440 868000 12000 124000			263440 868000 12000 124000	
+¥2 +¥28000 +¥500 +¥8000	CONDUIT, FRE, 3 W/FITT PRE-CAST MANHOLES HP-20 PULL BOX TYPE SURGE ARRESTORS & LINK BOXES INSTALLED IN MH'S	31000 18 9 9	lf Ba Ba Ba				62000 504000 4500 72000			62000 504000 4500 72000	
+Y8.65	 TAX	37431	LS				323778	****	끄C격추CR도 발 웹 크 :	323778	
	COMPANY GROUP SUBTOTAL						4066894			4066894	
	•										

LEGEND: \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXPIRED COSTS • • •

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PRELIMINARY PRINT DATE 12	2/15/05			ESTIMP REPO	ATING SECT ORT BY GRO	ion" . UP,		CEES.R1 PAGE 5 BST. NO.: 05-4147-AB-00 OLDEST GROUP UPDATE 10/27/05				
CODE	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	EQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACT UNIT PRICE	
**********					**********						*******	
072(10/28/05)	CC:TRENCHING GROUP FACTORS:				1.20	· 1.20		1 09				
	WASHINGTON TO CEDAR ST DIRECT 1-TRENCH FOR A TRENCH						•					
	LENGTH OF 15,840 LF LESS 400LF FOR BORINGS THE TOTAL TRENCH LENGTH IS 15,440LF				, ••• <u>.</u>							
	TRENCH IS 8'DEEP X 3'WIDE 13724CY				· · ·			•				
HT20C0045500	SAW CUT PAVEMENT	20000										
512000943300	TRENCH AREA REM AND REPLACED 15,440'X3'W/9 PAVEMENT RESTORATION	30880	* T k	1729	151629	31564		84148	267342	267342	8.66	
1T0701070500	003, ASPH HOT MIX, 2"	5147	*SY	412	42384	2902		39655	84940	84940	16 50	
IT0701160500	012, ASPH BASE BINDER, 4"	5147	*8Y	515	52980	3627		79310	135917	135917	26.41	
170301065500	15A, HOT MIX, TEMP, 3"	5147	*sy *sy	777 721	71510 73308	585 9854		97120 70034	169214 153196	169214 153196	32.88 29.76	
UT2000755900	PLACE CRSHD STN, BASE, TO6" RENOVE EXISTING PAVEMENT	1030	*CY	562	55732	8406			64138	64138	62.27	
+125/85	TOTAL=15440 X 3LF X 10"TH REMV/DISP PAVING, ASPHALT	1430	CY	1262	128700.	•		77935	206635	206635	144.50	
IT0501 <b>04050</b> 0	15440' X 8'X 2 SIDES 41, PLACE/REMOVE SHEETING	247040	*SF	11117	1195456	8360	• •	85629	1289445	1289445	5.22	
UC0222101500 UC0222211500 UC0222202500	10% BY HAND; 70% BY MACH 20% ROCK ROCK EXC, BACKHOE W/HO-RAM BARTH EXC, MACHINE EARTH EXC, HAND, 5-10'D	2745 9607 1372	*CY *CY CY	5932 2459 4532	623226 248676 419149	188907 20410			812132 269086 419149	812132 269086 419149	295.86 28.01 305.50	
UC0222306500 UC0222221500	BARTH FILL, FURN & INSTALL BARTH DISPOSAL	8234 16469	*CY *CY	1392 2306	141203 213956	11588 61423		188476 401928	341267 677306	341267 677306	41.45 41.13	
	1000' X 100'WIDE STREET IF REQUIRED			e la	ta da da da	17 g						

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LEGEND: \* - (BEFORE UNIT OF MEASURE) THE LINE HAS EXFIRED COSTS

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PRELIMINARY				BSTIM	TING SECT	ION			CEB	S.R1 . P#	GE 6
PRINT DATE 1:	2/15/05			RBP	ORT BY GRO	UP		OLDES	EST T GROUP UP	. NO.: 05- DATE 10/27	4147-AB-00 /05
************		*******				00222246682	**********				
CODE	GROUP/LINE DESCRIPTION	QUANT	" UNIT	MANHR S	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
		*********	194229;								
0/2(10/28/05)	GROUP FACTORS:				1.20	1.20		1.09			
+13/95	ALLOW FOR MILLING&REPAV'G										
+16/85	REPAVING	12000 12000	sy sy	1101 1355	112320 138240			68016 83712	180336 221952	180336	15.03
	1.15 TRAFFIC STIPS AND BARRICADES				•					~~1)]6	10.50
+E2000 +H16/100	TANK RENTAL/MONTH	1	MON			2400			2400	2400	2400.00
+M.5	DISPOSAL OF WATER/GAL	5000	GAL	80	9600			2725	9600 2725	9600 2725	1920.00
+15000/85	ALLOW FOR INTERFERENCES	1	LS	106	10800			6540	17340	17340	17340.00
+5000/85	ALLOW FOR TEMP SUPPORT OF UG UTILIT	1	LS	35	3600			2190	5790	5700	<b>FR0</b> 00
+15000/85	TRENCH PROTECTION	1	LS	106	10800			6540	17340	17340	3780.00
IT06010705 <b>00</b>	49, plate, pedestrian, 4move	38600	*sf	1312	146163	. 32248		64297	242708	242708	1/340.00
		******	******	********					242700	242/00 RD1222288	0.23
	CONTRACT GROUP SUBTOTAL			37811	3849431	382274		1358244	5589949	5589949	
075(10/27/05)	CC:BORING				.,,,						
-2000000/05		_			·						
+100000/85	2-26 BORINGS SITE RESTORATION	1	LS LS	14118 706	1200000 60000			800000 40000	2000000 100000	2000000 100000	2000000.00
	THIS LINE ITEM COVERS THE JACKING & THE BORING		•		••••						
	UNDER THE RIVER & X-WAY										
0 = = = = = = = = = = = = = = = = = = =	CONTRACT GROUP SUBTOTAL	19280622 		14824	1260000 -			840000	2100000	2100000	*********
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LEGEND					art terte te	•					
* - (BE	FORE UNIT OF MEASURE) THE L	INB HAS	EXPIR	ED COSTS	t h						
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PRELIMINARY PRINT DATE 1	2/15/05			ESTIM Repo	ATING SECT	ION UP		CEES.R1 PAGE 7 BST. NO.: 05-4147-AB-00 OLDEST GROUP UPDATE 10/27/05				
CODB	GROUP/LINE DESCRIPTION	QUAN	T UNIT	MANHRS	LABOR	BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	====== Total	CONTRACT UNIT PRICE	
							*********		*********		 Restates	
081(10/28/05)	CC:CONDUIT/ MH INSTALL GROUP FACTORS:				1.04							
UT2020561500	8-6" FRE, 2-3" FRE 4 2-4" HDPE CONDUITS DIRECT 1-TRENCH FOR A TOTAL LENGTH OF 15840LP ASSEMBLE IN TRENCH CONNECT CONDUITS INST PVC CONDUITS 4	31000	2									
UB0110408500 UB0110414500 +80/108/100 +25000/108/99 +H.5/108	CONDUIT, FRE, UNDER GR, 3 CONDUIT, FRE, UNDER GR, 6 INSTALL DUCT SYSTEM PC MANHOLES HP-20 DROP PLATES	31000 31000 124000 15440 18 1780	*LF LF LF BA BA	496 1984 13764 11437 4125 890	39710 225142 1552653 1284608 463320 99965	313	·	88660 172608 1366108 4500	128683 397750 2918761 1284608 467820 99965	128683 397750 2918761 1284608 467820	4.15 12.83 23.54 83.20 25990.00	
UC0330107500	CONC, COND ENCASEMENT, DC	6862	*CY	3795	319290			616619	935909	935909	126 20	
+H72/108/500	INSTALL ALARMS&PRESS SW'S INCL FITTINGS & HOWRE 2M X 3 DAYS X 12 H/D	2	BY	144	16174			1000	17174	17174	8587.04	
	POTHEAD STANDS AND IN STATION CIVIL WORR W/ STATION FUNDING TWO SETS OF RISER FIFING TO TWO SETS OF RISER PIFING				2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -							
+28/108/90 +21/108/90	RISER PIPING TO POTHEADS OTHER CONDUIT	1000	lf Lf	233 175	26208 19656		2800 2100		26208 19656	29008 21756	26.21 19.66	
+650/90	SPLICE/PULL BOXES	9	BA	39	3650		2340		3650	5990	405.60	
	1.20 FACTOR 1.10 TRAFFIC STIPS 1.05 CLEANUP/BARRICADES 1.05 TRAFFIC CONGESTION											
	CONTRACT GROUP SUBTOTAL	*****		37082	4050375	313	7240	2249495	6300184	6307424		
					•							
					11 J. 16 1.							
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LEGEND: * - (BE	FORE INIT OF MEASURE) THE	THE HAS	RYDTI									
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PRELIMINARY PRINT DATE 1	2/15/05			BSTIMA Repo	TING SECT RT BY GRO	ION UP		CEES.R1 PAGE 8 EST. NO.: 05-4147-AB-00 Oldest group update 10/27/05				
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR	equipment	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT	TOTAL	CONTRACI UNIT PRICE	
105(10/28/05					Ebczgozan:			423CE28200		******		
+L65/65	BLECTRIC OP, MANHATTAN	300	HOUR	300	19500					19500		
	COMPANY GROUP SUBTOTAL			300	19500	, , ,	2240202888	******	= 4 ¥ = 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	19500	2222828282	
120(10/28/05)	) CL:CHEM LAB											
+L80/80	CEN.OPR, LABORATORY DIV.	200	HRS	200	16000					16000		
	COMPANY GROUP SUBTOTAL	C 4 5 3 4 8 8	0#1915	200	16000		*========			16000	*********	
140(10/28/05)	CL:TRANSPORTATION DEPT.											
+L82/82	TRANS. AND STORES, TRAN. OPR	3600	HRS	3600	295200					295200		
+100000	EQUIPMENT RENTAL	1	LS				100000			100000		
	COMPANY GROUP SUBTOTAL	ᄡᄨᄡᆂᆂᆂᇽᇢ		3600	295200	uxcaecee	100000	특별별적주권 및 <u>중 중 등 5</u>	************	395200		
150(10/28/05)	CL:P.M. &I				* <sup>1</sup>							
+L67/67	P.M. & I. 3Personsx10hrs/daxx52wks 6days/wbek	9360	HRS	9360	627120					627120		
*****	COMPANY GROUP SUBTOTAL	*******		9360	627120	##00380023:				627120		
160/10/29/05)	AT . CANATAN ADDDDD				•		•					
165/65	CLISIATION OPERATOR	1.00										
	SUBSTRIION OPERATOR	16U	HKS	160	10400					10400		
	COMPANY GROUP SUBTOTAL			160	10400					10400		
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PRELIMINARY PRINT DATE 12/15/05		Cline	ESTIMATING SECTION REPORT BY GROUP				CBES.R1 PAGE 9 BST. NO.: 05-4147-AB-00 OLDEST GROUP UPDATE 10/27/05			
CODE	GROUP/LINE DESCRIPTION	QUANT	UNIT	MANHRS	LABOR BQUIPMENT	COMPANY MATERIAL	CONTRACT MATERIAL	CONTRACT TOTAL	TOTAL	CONTRACT UNIT PRICE
170(10/28/05)	ODC:ENV TESTING/TEST PITS				ᅸᇘᇕᆍᇿᅑᅖᆑᇽᇕᆂᅊᅶᇞᄗᆇᆂᇆᅿ ᆞ	9358503380 9358503380	*******	**********	9632300ese	는 F 대 밖 관 관 관 문 프
+M100000	CONCRETE & SOIL TESTING	1	LS				100000	100000	100000	100000.00
	CONTRACT GROUP SUBTOTAL					422636C382	100000	100000	100000	

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#### \*\* BND OF ESTIMATE REPORT \*\*

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### Case 05-T-1369 Con Ed Cedar Street Project

### STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

<b>Request No.:</b>	DPS-13
<b>Requested By:</b>	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	
Witness:	
Subject:	Conduits

Provide a copy of the specification sheets for the fiber glass reinforced epoxy (FRE) to be utilized on this job.

Response to DPS-13:

1

See Attachment DPS-13.

Name of Respondent Michael Simione

1

Attachment DPS-13

# CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. 4 IRVING PLACE NEW YORK, NEW YORK 10003

### CONSTRUCTION SPECIFICATION

#### CE-ES-3004

### CONSTRUCTION SPECIFICATION FOR THE INSTALLATION OF UNDERGROUND FIBERGLASS REINFORCED EPOXY (FRE) AND POLYVINYL CHLORIDE (PVC) CONDUITS

# SECTION I - GENERAL REQUIREMENTS

### **REVISION 01**

#### OCTOBER, 2004

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Prepared By:

Alan M. DeSimone / 10/26/2004 Name / Date

Approved By:

Bruce G. Horowitz 11/7/04 Section Manager / Date

Page 1 of 15

Paper copies of the Engineering Operations Manual are uncontrolled and therefore may be outdated. Please verify that you have the current version prior to use by viewing the Central Engineering website (http://cengl).
#### SECTION I - GENERAL REQUIREMENTS

#### 1.0 SCOPE

- 1.1 This specification provides the general requirements for the installation of underground fiberglass reinforced epoxy (FRE) and polyvinyl chloride (PVC) conduits at substations and generating stations, owned by the Consolidated Edison Company of New York, Inc., hereafter, the "Company" and:
  - 1.1.1 Identifies all FRE and PVC conduits to be installed.
  - 1.1.2 Identifies the location where the FRE and PVC conduits are to be installed.
  - 1.1.3 Describes the conditions to be met for the installation of the FRE and PVC conduits.

#### 2.0 PROJECT DESCRIPTION

2.1 Installation of underground FRE and PVC conduits at substations and generating stations.

# 3.0 APPLICABLE STANDARDS AND REFERENCES

- 3.1 The latest editions of the following laws, regulations, codes and standards issued by the following organizations and agencies are applicable to the scope of work covered in this specification:
- n her en Net en N

- Electronic and Electrical Engineers (IEEE)
- National Electric Code (NEC)
- National Electric Safety Code
- American National Standards Institute (ANSI)
- National Electric Manufactures Association (NEMA)
- New York State Department of Environmental Conservation (NYSDEC)
- New York City Department of Environmental Protection (NYCDEP)
- United States Environmental Protection Agency (EPA)
- Occupational Health and Safety Administration (OSHA)
- "Articles of the General Condition" of the Consolidated Edison Company of New York, Inc.
- Contractor HASP Manual.
- 3.2 All violations arising from non-compliance of applicable standards and references are the responsibility of the Contractor and shall be promptly rectified.

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# 4.0 CONTRACT DRAWINGS, SUPPLEMENTAL SPECIFICATIONS, AND MATERIALS LISTS

- 4.1 Drawings, specifications and material lists (electrical, transmission, mechanical, civil, etc.) are provided in Section III of this specification.
- 4.2 All specifications and drawings attached or referenced herein are the latest revisions. Any new revisions dealing with the subject removals will be furnished as an addendum to the specification and attached tables. All work shall be performed in accordance with the latest detail specification and drawings.
- 4.3 The Contractor shall submit the "As Built" Drawings as soon as possible after the changes have been incorporated in order that the original drawings may be revised.
- 4.4 The bid drawings are construction drawings. The Contractor shall do all work strictly in accordance with such construction drawings
- 4.5 Specifications and the drawings are complementary and are intended to completely describe the work and what is called for by one, shall be as if, called for by both. If there are any discrepancies or obvious errors in them, the Contractor shall refer the same to the Company for its decision and shall abide by that decision.
- 4.6 Materials or work described in words or phrases, which so applied, have a well-known technical or trade meaning shall be held to refer to such recognized standards.
  - 4.7 Certain notes on equipment manufacturers' drawings included in the specification, such as "by others" do not apply to this specification. These notes apply to the equipment manufacturer only and the Contractor shall request a clarification by the Company, when in doubt of their interpretation
  - 4.8 Final installation drawings covering this work will be issued for construction purposes. The Contractor shall do all the work strictly in accordance with such installation drawings.
  - 4.9 In cases where it may be found impracticable to adhere strictly to a drawing during construction, the Contractor shall inform the Company's representative on the job, who may authorize the Contractor to modify the work and who will initiate the revision of the drawings involved.
  - 4.10 The Company will submit to the Contractor a schedule for the performance of the work covered by this specification to which the Contractor shall be required to adhere. Changes in this schedule may be made by mutual agreement of both parties.
  - 4.11 The Contractor shall submit shop or setting drawings and schedules required for the work of the various trades; and the Company will review and approve the drawings with reasonable promptness. The Contractor shall make any corrections required by the Company.

#### Page 3 of 15

#### 5.0 SUBMITTALS

- 5,1 All work by the Contractor shall be performed in accordance with the submitted and approved, site specific Environmental, Health and Safety Plan (eHASP).
- The Contractor is responsible for submitting an Environmental and Construction Plan 5.2 prior to start of all work. The ECP will be approved by the Company.
- 5.3 The Contractor shall furnish for approval any samples of material or workmanship as required and requested by the Company. The final work shall be done in accordance with approved samples.
- 5.4 The Contractor shall submit to the Company, copies of all required permits, licenses, etc., prior to the start of work.

#### 6.0 SITE REPRESENTATION

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- 6.1 Upon execution of the Contract, the Company will identify in writing to the Contractor, an Engineering Field Representative for the Project. The Engineering Field Representative shall have full authority to act, or to cause others to act, on behalf of the Company, to assure that the work is carried out in full compliance with the requirements of the Contract, and to otherwise generally protect the interests of the Company. The Company may change the Engineering Field Representative at any time by notifying the Contractor, tale i e se in writing, of the name of the new Engineering Field Representative and the effective date of the change.
  - 6.2 The Company may also designate one or more additional persons to carry out certain responsibilities on its behalf, and, in that event, the Engineering Field Representative will instruct the Contractor as to the relationship between the Engineering Field Representative and such other designated persons.
  - Except as specifically set forth elsewhere in these General Requirements or as may be 6.3 otherwise directed by the Engineering Field Representative, in writing, the Engineering Field Representative shall be the principal first point of contact for the Contractor in all matters relating to the execution of the Work.
  - 6.4 No action or decision of the Engineering Field Representative or any other representative of the Company will in any way supersede or diminish the Contractor's obligation to perform the Work in complete conformance with all requirements of the Contract.

#### 7.0 QUALITY ASSURANCE

- 7.1 Qualification and personnel certifications
  - The Contractor shall provide copies of all necessary documentation for personnel 7.1.1 qualification and certifications required to perform the work.

#### Page 4 of 15

- 7.2 Regulatory and permit requirements
  - The Contractor shall obtain all necessary regulatory and permits required to 7.2.1 complete the work and project. Copies of all permits, licenses, etc, shall be provided to the Company and maintained at the work site. This includes but is not limited to:
    - а. Asbestos permits (ACP-5, ACP-7)

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- b. SPDES permits
- c. Waste disposal permits
- d. Building demolition permits
- 7.3 Test reports, material certifications, and code stamps

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7.3.1 The Contractor shall obtain all necessary code stamps for any materials. He shall also obtain and provide copies of all test reports and material certifications for materials, products, etc.

• : . 8.0 PROPOSALS the forces of the state of 

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Prior to and as necessary during the progress of the work under the contract, the Contractor's representative shall confer with the Company's representative at the job for the purpose of formulating a working program, so that the work performed under one or more contracts may be coordinated to prevent, if possible, any interference with the progress of work of the other Contractors.

#### 9.0 SEQUENCING AND SCHEDULING

- All work shall be carried out in such a manner that there will be no interference with 9.1 station operation. The Company, through a designated representative, will arrange for outages of equipment and for assuring safe working conditions where electrical circuits and equipment are involved. No work on normally alive electrical circuits shall be started without the express permission of the Company's designated representative.
- 9.2 The Contractor shall do all possible preparatory work in advance of equipment shutdown, and he shall provide adequate manpower to do the outage work in the time allotted. The Company reserves the right to perform any items of work which because of operating conditions, should, in the Company's opinion, be performed by Company forces
- No work will be permitted on live electrical circuits, nor in central control areas. No 9.3 cutting will be allowed into floors, walls or ducts without express approval of the Company's inspectors and the Station Supervisor. The substation will be maintained in operation during the entire construction period. No compartments, doors or cabinets may be opened or entered into without Company approval. When permission is obtained to work in operating areas, adequate safety precautions shall be exercised to protect personnel and equipment, including barriers, signs and roped-off area. The work schedule shall include allowance for periods when equipment may be taken out of service for alteration, and for work in confined spaces.

#### Page 5 of 15

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#### 10.0 TRAINING DEMONSTRATION

10.1 None Required

#### 11.0 OWNER ACCEPTANCE

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- A final joint inspection of the completed removal shall be made by representatives of the 11.1 Company and the Contractor. Final acceptance of the Contractor's work will be contingent upon this inspection in conjunction with other requirements of the contract.
- The Company and its representatives shall at all times have access to the Work and the 11.2 Contractor shall provide proper facilities for such access and for the inspection and testing of the Work.
- 11.3 The Contractor shall keep the Company and the Architect informed of the progress of the Work and shall notify the Company sufficiently in advance of enclosing items of Work, or the work of other contractors, to provide reasonable time for the Company to perform the necessary inspection. No Work, nor the work of other contractors, shall be closed or covered until it has been duly inspected and approved. Should uninspected Work or work of other contractors be covered by the Contractor prior to its inspection, the Contractor shall, if directed by the Company and at its own expense, uncover all such Work, or such work of other contractors, so that it can be properly inspected, and after such inspection the Contractor shall properly repair and replace all affected Work, or Le di terre di terre di work of other contractors, at its own cost and expense. a nan shika pro anaph
  - 11.4 The Company shall arrange for such inspection of the Work as may be necessary. If, in the opinion of the Company or Architect, the Work is not being installed as required by the Contract, the Company may order such work stopped pending further investigation and a decision by the Company.
    - Tests to determine the quality of materials will, unless otherwise specified be ordered by 11.5 the Company at the discretion of the Company. If the specifications require the Contractor to provide the inspection service or tests, such inspection or tests shall be made by an engineer or laboratory approved by the Company. Such engineer or laboratory must furnish the Company with as many copies of any inspection or test reports as may be requested. Unless otherwise specified, tests on materials are to be made in accordance with standard methods adopted by the American Society for Testing and Materials.
    - The right of the Company to inspect and generally supervise the Work is to make certain 11.6 that the Work conforms to the drawings and specifications and the other Contract Documents. Such inspection and general supervision are not intended to control the contractor as to the manner of performance of the Work.
    - Any Work installed by the Contractor and found, by the Company, to be defective, or not 11.7 in strict conformance with the requirements of the drawings and specifications, shall be corrected or removed immediately and satisfactory materials or Work substituted therefore without delay, unless the Company approves such Work subject to an appropriate adjustment in the contract price. The Contractor shall also make good the work of all the other contractors destroyed or damaged by such corrective Work, removal or replacement. The cost of such corrective Work, removal and replacement shall be at the expense of the Contractor. The Contractor shall promptly remove all rejected

#### Page 6 of 15

materials from the Premises. The Company's authority to reject any Work of the Contractor and any decision of either exercising or not exercising such authority shall not give rise to any duty or responsibility of the Company to the Contractor or any Subcontractor or Supplier.

11.8 Should the Company elect, at any time before Final Acceptance, to examine Work already completed by removing, uncovering or testing the same, the Contractor shall, on request, promptly furnish all necessary facilities, labor and materials to remove or uncover such Work to permit such inspection, examination or testing. If such Work is found to be defective or nonconforming in any significant respect, the Contractor shall pay all the expenses of such removal, uncovering, examination, testing and satisfactory reconstruction. If the Work is found to meet the requirements of the Contract documents, the Company shall compensate the Contractor by Change Order, for reasonable additional incurred costs involved in such removal, uncovering, examination, testing and reconstruction and if completion of the Work has been delayed thereby, the Company shall grant the Contractor a reasonable extension in the time allowed for completion.

11.9 No previous inspection or payment shall be held as an acceptance of defective Work or materials or relieve the Contractor from the obligation to furnish sound materials and perform satisfactory Work in accordance with the Contract Documents.

11.10 Final payment shall not relieve the Contractor of the responsibility for faulty materials or workmanship. The Contractor shall remedy all such defects, paying the cost of such corrective Work and of repair of any damage to other work resulting there from, which shall appear within any guarantee or warranty period provided by the Contractor

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# CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. 4 IRVING PLACE NEW YORK, NEW YORK 10003

# Section II – PRODUCTS AND SERVICES

# 1.0 WORK TO BE PERFORMED BY CONTRACTOR

- 1.1 The Contractor shall supply all FRE and PVC conduits, including all necessary associated bends, fittings, supports, etc., as required by the length and nature of the runs for a complete job.
- 1.2 The Contractor shall install all FRE and PVC conduits and associated bends, fittings, and supports as described herein and in accordance with the applicable drawings showing such underground installations and the miscellaneous details pertaining thereto, including All Stations Drawing No. A218486, latest revision, and the attached drawings.
- 1.3 All of the FRE and PVC type conduits and associated materials to be installed in accordance with this specification shall be provided as called for in the detail construction specification associated with this project, the appropriate material lists and Company drawings.
- 1.4 Bends and/or sweeps shall conform to the radii specified in NEMA Specification TC 14 for iron pipe size conduits.

1.5Following are the minimum radii for the indicated sizes for FRE and PVC conduits.1.5.124" radius for 2.0" conduit

- 1.5.2 30" radius for 3.0" conduit
- 1.5.3 42" radius for 4.0" conduit
- 1.5.4 60" radius for 5.0" conduit
- 1.5.5 72" radius for 6.0" conduit
- 1.6 The installation shall follow the drawings as closely as possible, except where obvious unforeseen interferences occur.
- 1.7 Where field changes are required, every effort shall be mad to coordinate the change with other conduit work, structural work, plumbing work, etc. being accomplished at the site. A complete record of all such changes shall be made by the installation forces on their copies of the affected drawings in order that the original tracings may later be revised to show the "As built" conditions.
- 1.8 In any event, no conduit runs shall be modified without the prior approval of the Company's construction representative at the work site after consultation with the Company's Central Engineering organization. Following completion of the work, all marked prints showing the changes in the conduit installation, including any pertinent dimensions and conduit identification information, shall be forwarded as part of the "As Constructed" Report to the Chief Engineer, (or his representative, the "As Built" Drawing Coordinator) Central Engineering, by the Site Construction Representative in accordance with the Corporate Instruction No. CI-290-3.

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- 1.9 When cutting of the conduits is required, the Contractor shall make the cuts square and remove all sharp edges.
- 1.10 Conduits that are to be extended in the future shall have the exposed ends capped with plastic caps. An anti-seizing compound shall be used to facilitate the cap removal. During construction conduit ends shall not be left open overnight.
- 1.11 All conduit joints, fittings and connections shall be made thoroughly watertight. The recommendation of the specific manufacturer shall be followed as closely as possible in order to assure that the conduit joints are made waterproof.
- 1.12 Substitution of smaller conduit bends shall not be permitted unless written approval has been obtained from the Company's designated Central Engineering representative.
- 1.13 Any installed conduit bends of a smaller radius then called for in the construction drawing and specifications shall be replaced. If such installation was due to the installer's negligence, all labor, materials and equipment required for the removal of such rejected installations(s) and the replacement thereof with the specified bends shall be at the installer's expense.
- 1.14 When conduits are specified to be terminated at a floor or foundation for exposed extension, a FRE or PVC female threaded (NPT) adaptor shall be installed to accomplish the transition between FRE and steel or aluminum conduit (see Drawing 303052, latest revision.)
  - 1.14.1 The FRE or PVC female adapter (FRE or PVC to steel or aluminum) shall be installed flush with the floor or foundation.
  - 1.14.2 When the conduit is installed at the edge of a foundation it shall be fastened to the foundation using a universal channel (Unistrut, Versabar, etc.) and shall be painted in accordance with Specification EO-1122, latest revision.
  - 1.14.3 A heavy duty plastic plug shall be installed on the adaptor. This will prevent foreign materials from getting into the empty conduit and expedite the connection of the steel conduit when the underground conduit is to be extended in the future.
- 1.15 When conduits are arranged in conduit banks, Company approved conduit spacers of the appropriate sizes shall be used. The spacing between conduits shall be 2 inches. Maximum distance between spacers shall be 6'-0" (see Drawing No. 303056, latest revision.) The trenches shall be back-filled as described in General Specification EO-1181, latest revision, including the bedding requirements.
- 1.16 Generally, all conduits will be direct buried and a reinforced concrete envelope is not required, except when installed in heavy traffic areas and the cover is less than 30 inches. All work associated with the installation of the concrete envelope, if required, shall be covered by separately issued specifications.
- 1.17 Conduits entering manholes, vaults, boxes, trenches or terminating in concrete foundations not intended for extension, shall be terminated with bell-end fittings installed flush with the inside wall of the manhole or with the top of foundation.

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- 1.18 When conduit banks are to be extended beyond the station property line, the installer shall terminate the conduit bank 1'-0" outside of the property line for extension by others. Conduit banks thus terminated shall be sealed with removable plastic caps.
- 1.19 All FRE and PVC conduits shall be mandrelled after installation. The mandrelling shall be done in accordance with the latest revision of Specification EO-4410-C. In no event shall be diameter of the mandrel be less than 0.25 inches smaller than the inside diameter of the conduit.
- 1.20 If difficulties are encountered in the mandrelling of the conduit, a series of wire brushes shall be drawn through the conduit, once in each direction, using a trailing line. The wire brushes shall be 0.125 inch diameter less than the inside diameter of the conduit. If the initial attempt is not successful, the operation must be repeated using progressively smaller brushes, but not smaller than required for the installation of the specified cable(s).
- 1.21 Any method employed for the clearing of the conduit must be accomplished without damage to the smooth finish of the interior walls of the conduit. Any damaged conduit must be replaced.
- 1.22 No conduit installation will be regarded as acceptable unless free passage of the mandrel is obtained in both directions.
- 1.23 When a PVC or FRE conduit bank passes near a stainless steel or copper high pressure feeder, a minimum of 12 inches shall be maintained between the outer edge of the pipe and the bottom edge of the conductor duct bank (see Drawing No. 303055, latest revision.)
- 1.24 When a PVC or FRE conduit is to be terminated through the side of a cable trench, it shall be terminated with "radius bell-end" fittings, and then made water tight with non-asbestos duct seal, once all cables are in place (see Drawing No. 303051, latest revision).
- 1.25 When PVC and FRE conduits are to be terminated in a switchgear slab, where the distance between the bottom of the high voltage potheads and the switchgear slab is less then 40 inches, the details on Drawing No. 303053, latest revision, are to be followed.
- 1.26 When PVC or FRE conduits are to be terminated in the switchgear floor, the details on Drawing No. 303054, latest revision, are to be followed. Once all cables are in place, the installation shall be made weather tight with non-asbestos duct seal.
- 1.27 When PVC or FRE conduits are to be terminated through the bottom of cable trenches, the details on Drawing No. 303057, latest revision, are to be followed.
- 1.28 Direct buried cables shall be terminated above grade following the details on Drawing No. 303058, latest revision.
- 1.29 When PVC or FRE conduits are to be terminated in precast cable trenches, the details on Drawing No. 303059, latest revision, are to be followed. After all cables are pulled, the installation shall be made weather tight by the installation of non-asbestos duct seal.

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# 2.0 WORK TO BE PERFORMED BY OTHERS

- 2.1 The Company will test all materials, cables, conduits, insulation, gaskets, for possible asbestos containing materials. The Company shall perform all necessary asbestos abatement and disposal of all ACM.
- 2.2 Transportation of debris offsite.
- 2.3 Installation of other pieces of equipment.

# 3.0 REQUIRED SUBMITTALS

- 3.1 Environmental, Health, and Safety Plans (eHASP).
- 3.2 Environmental Construction Plan (ECP)
- 3.3 Shop drawings, product data, & samples.
- 3.4 Quality Assurance/Control submittals.
- .3.5 "As Constructed" drawings, O&M manuals, training documentation.
- 3.6 Copies of all necessary permits, licenses, etc.
- 3.7 Detailed construction and removal schedule.

#### 4.0 DELIVERY, STORAGE, AND HANDLING

- 4.1 The Contractor shall furnish all necessary labor, equipment and material required to remove and dispose of the equipment and materials at the construction site. Each shipping crate or drum must be inspected for damage before being placed on the transporting vehicle. If there is visible evidence of damage to the crate or equipment, this must be reported immediately to the Company representative on site to facilitate any damage claims against the carrier or manufacturer.
- 4.2 The Contractor shall crate the equipment or waste materials carefully, taking all necessary precautions to prevent damage to the existing equipment.
- 4.3 The Contractor shall inspect the shipping manifest and verify that all equipment and/or materials specified herein are on the shipping manifest. The Contractor shall immediately notify the Company representative on site if there is shortage or excess of equipment and/or materials.
- 4.4 The Contractor shall remove and dispose of all shipping crates and packing materials from the construction site immediately after the equipment is loaded on the transporting vehicle.
- 4.5 The Contractor shall remove, store and transport off site, all associated materials and waste items referred to in the attached drawings and specifications.

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- 4.6 The Contractor, on a daily basis, shall dispose of all packing materials, crating, general debris and other waste items from the site, in order to maintain proper safety, environmental and sanitary conditions on the site.
- 4.7 The Contractor shall be responsible for the security and loss of his material and equipment.
- 4.8 The Contractor shall maintain the work area in a neat and orderly condition at all times. Site clean-up shall be performed on a daily basis and as directed by the field representative, and shall include removal of all material no longer needed for construction purposes as well as papers, cups, cans, and other non-construction debris. The Contractor shall be responsible to furnish and maintain trash receptacles suitable for the type and quantity of material to be removed. Type and quantity shall be subject to the approval of the field representative. At the completion of the job the site should be left in a clean and finished condition.
- 4.9 The Contractor shall dispose of all construction debris, equipment, etc. in accordance with all federal, state and local environmental laws and regulations.

#### 5.0 FABRICATION

5.1 Items must be manufactured, fabricated, or assembled prior to delivery to the site. If necessary, the Contractor shall pre-assemble all working parts prior to disassembly to shipment to the job site.

## 6.0 MATERIALS AND MIXES

- 6.1 All FRE and PVC conduits and fittings to be installed by the Contractor as part of this contract shall be purchased only from Company approved vendors.
- 6.2 The conduits and fittings for FRE conduits shall be manufactured with thermoset epoxy resins reinforced with continuous wound glass filaments as described in the Purchase Specification No. EO-100,628 and Specification for Fiberglass Reinforced Epoxy Conduits and Fittings No. EO-5433, latest revision.

#### 7.0 PREPARATION AND MAINTENANCE

- 7.1 The Contractor shall do all possible preparatory work in advance of equipment shutdown, and he shall provide adequate manpower to do the outage work in the time allotted. The Company reserves the right to perform any items of work which because of operating conditions, should, in the Company's opinion, be performed by Company forces.
- 7.2 The Contractor shall confine his equipment, storage of materials and the operations of his workmen to the limits indicated by law, ordinances, permits or reasonable direction of the Company or its duly authorized representatives, and shall not unreasonably encumber the premises with his materials or equipment.
- 7.3 All arrangements for the use of the highways, public property and private property for the storage of materials or equipment shall be made by the Contractor, and he shall obtain and pay for any permits that may be required for the storage of materials and equipment.

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- 7.4 The detailed part of this specification will inform the Contractor of the environmental conditions and hazards to be found on the job site. The Contractor is responsible for implementing an effective Environment, Health and Safety (EH&S) program for performance of the Work
- 7.5 Changes to project activities/materials or unanticipated site conditions may require a reassessment and/or modification of project EH&S requirements. Additional EH&S measures may be required (sampling, testing, monitoring, personal protective equipment, permits/licenses/approvals). If issues or concerns arise which were not anticipated, the Contractor shall stop work activity, take appropriate precautions and contact the Site Representative immediately
- 7.6 The Site Representative is responsible for overseeing the environment, health and safety of Company employees and Contractor personnel. The Contractor is required to comply with all federal, state and local requirements, as well as any Company policy or procedure directed by the Site Representative, applicable to the performance of the Work.
- 7.7 The Site Representative will monitor the Contractor's EH&S compliance and to ensure immediate correction of any EH&S hazard or procedural non-compliance. The Site Representative has the authority and responsibility to stop an activity or job, if in his professional assessment, the Contractor shows a disregard, lack of knowledge or expertise for any EH&S requirement. There shall be no increase in cost to the Company or schedule relaxation allowed as a result of work stoppage due to the Contractor's disregard, lack of knowledge or expertise for EH&S requirements.
- 7.8 Prior to bringing any materials on the job site or Company property, the Contractor shall submit Material Safety Data Sheets (MSDS) to the Site Representative for approval. The MSDS's will be submitted as part of the required Health and Safety Plan (HASP). The Contractor must keep copies of all MSDS's on the job site during the Work
- 7.9 The Contractor shall obtain any permit, license or approval necessary to perform the Work in accordance with all federal, New York State and local regulations, codes and laws.

### 8.0 CONSTRUCTION

8.1 None.

### 9.0 FIELD QUALITY CONTROL

9.1 All parts of the Work shall throughout the time of the performance of the Contract, be subject to inspection by the Company. The Company shall be final judge of the quality and acceptability of the Work, the materials and equipment used herein, and the process of the manufacture and methods of constructions employed in connection with the Work. The Company shall have the right to witness any tests the Contractor or third party conducts.

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- 9.2 If at any time prior to the completion of all of the Work, the Company finds as a result of any inspections any part of the Work, is not suitable or of good quality, or fails to conform to the specifications or drawings, the Company has the options to require the Contractor, at his expense and within reasonable time, to reconstruct, replace or correct the applicable Work.
- 9.3 Upon completion of the work, the Contractor shall clean the entire work area of all unused material and equipment. The Contractor shall remove all of his equipment and construction materials and vacate storage areas, which may have been temporarily assigned for his use by the Company. The Contractor will not leave any hazardous wastes, solid wastes, chemicals, lead, asbestos or other environmental hazards on the site.
- 9.4 This work will take place in an active, operational, high voltage substation. The Contractor shall not interfere wit the normal and/or emergency substation operation. Workers shall limit their access to active work areas only.
- 9.5 The Contractor shall use the Trades having jurisdiction to perform the work covered by this specification and he shall comply with all rules and regulations of Trades covering the type of work as accepted by a recognized group of trade employers. The employees shall be skilled in their particular lines and shall not conflict in any way with those of other Trades employed under other Company contracts at any location.

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#### 10.0 REPAIR AND RESTORATION

- 10.1 The Contractor shall remove and dispose of all equipment and materials as shown on the drawings, except where obvious, unforeseen interferences occur.
- 10.2 When field changes are required, every effort shall be made to coordinate the change with other conduit work, structural work, lighting installations, etc., being done at the same site. The Contractor shall keep a complete record of all such changes being made by his forces on the Contractor's copies of the affected drawings.
- 10.3 In event of damage, promptly make replacements and repairs to the approval of the Company's Project Engineer and at no additional cost. Additional time required to secure replacements and to make repairs will not be considered by the Company to justify any extension in the Contract Time of Completion.

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# SECTION III – CONSTRUCTION PACKAGE DOCUMENTS AND SUPPLEMENTAL SPECIFICATIONS PART 0 – (Contract Drawings, Tables, & Lists)

- 1.0 The list of contract drawings included with the construction package
- 2.0 The list of supplemental specifications and applicable revision. If the specification is not provided as a Part in this section, provide instructions where the specifications are to be found (e.g. Con Edison, Manual of Construction) and how to obtain copies.
- 3.0 Optional Information
  - 3.1 Provide Tables of requirement information.
  - 3.2 Provide lists of required materials or other deliverables.

### PART 1 thru XX – (Supplemental Specifications)

- 4.0 Each Part number 1 through as many as required. Each Part shall contain a supplemental specification for the project. Each Part shall have a cover page with applicable signatures from engineering and project personnel. Examples include, but are not limited to:
  - 4.1 Environmental, Health, and Safety (applicable sections).
  - 4.2 Detailed Civil Specification.
  - 4.3 CE-ES-6005 General Construction Information.
  - 4.4 Detailed Electrical Construction Specification

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# STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-14
<b>Requested By:</b>	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	
Witness:	
Subject:	Conduits

On page E-3-2, the application states that a 3/8 steel plate will be placed upon the top of the conduits for protection, but in figure E-3-1, the diagram states a 1 inch steel plate will be utilized. Which is correct?

# Response to DPS-14:

See Attachment DPS-14, the proposed trench cross section that indicates that 3/8 inch steel plate will be used for the typical trench cross section. One inch thick steel plate will be installed where there is only two feet or less of cover.

Name of Respondent Amit Mukhopadhyay

# Attachment DPS-14

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- (2) 3X2 BASE SPACERS (PART #\$288LJN
- (4) 3X2 INTERMEDIATE SPACERS (PART #S289LUN)

# STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-15
<b>Requested By:</b>	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	
Witness:	
Subject:	Duct Bank

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Are the duct banks going to be field constructed? If so, describe how they will be constructed. Is Con Ed going to use any reinforcing rods in the duct banks? Provide a description (including a catalogue cut sheet) of any reinforcing rod to be used.

# Response to DPS-15:

No steel reinforcing rods will be used. The installation contractor determines the construction method. However, the general approach is to assemble the spacers and FRE ducts in the cut trench. Concrete will be poured once a day, vibrated, then allowed to cure before any plywood sheeting is removed. Sand, the HDPE communications ducts, steel plating, the remaining backfill, and cold patch are then installed. Final roadway restoration will take place later.

# STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.: Requested By: Date of Request: Reply Date: Witness: Subject:

DPS-16 Hebert Joseph, (518) 486-2460

Request: December 12, 2005

Duct Bank

Explain and describe what effect the steel plate and any reinforcing rod will have upon the EMF of the cables. What effect will the steel plate and any reinforcing rod have upon the losses for the circuit?

# Response to DPS-16:

No reinforcing rods will be used. The 3/8" thick steel plate on top of the conduits will have a shielding factor of approximately 2.3 on the calculated maximum magnetic field, compared to having no steel plate. The steel plate would have no effect on magnetic field levels at 50 feet from the centerline of the feeder. The effect of the steel plate upon the losses for the circuit is negligible.

# STAFF OF THE DEPARTMENT OF PUBLIC SERVICE INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-17
<b>Requested By:</b>	Hebert Joseph, (518) 486-2460
Date of Request:	December 12, 2005
Reply Date:	·
Witness:	
Subject:	Cable

Does Con Ed plan to cross bond the cable sheath in the manholes? If so, provide a description of the method to be used and a copy of the company's specification for cross bonding.

# Response to DPS-17:

Con Edison does not have a cross bonding specification. The final sheath operation design is provided by the cable system supplier and is not yet available. However, it is anticipated that there will be several sheath bonding methods including single point and cross bonding. If a major cable section will be cross bonded, only the cable sheaths will be cross bonded in manholes. The cable will not be physically transposed. The respective sheath connections will be made in link boxes installed in each manhole or at the terminations.

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