APPENDIX A

GLOSSARY OF NOISE TERMINOLOGY

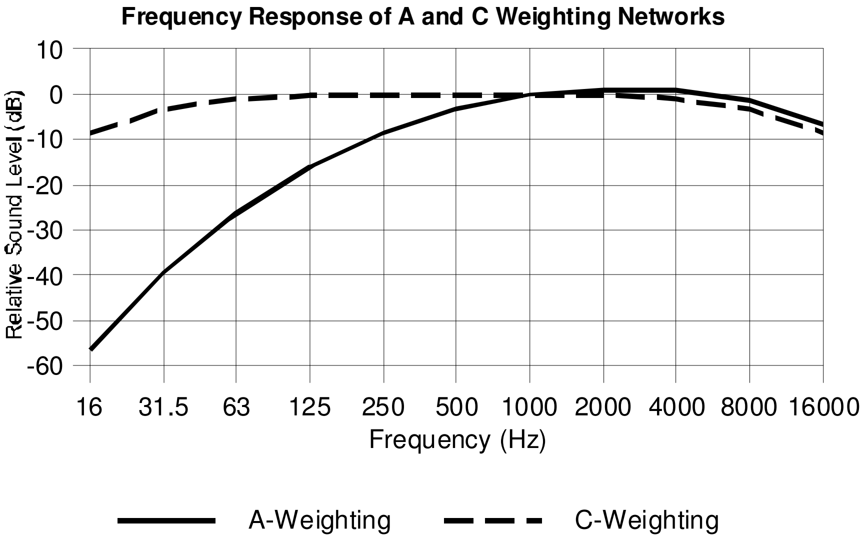
APPENDIX A: GLOSSARY OF NOISE TERMINOLOGY

Ambient or Background Noise: The ambient noise from all sources other than the sound of interest (i.e. sound other than that being measured). Under most MOE guidelines, aircraft overflights and train noise, due to their transient nature, are normally excluded from measurements of background noise.

Attenuation: The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.).

dB - Decibel: The logarithmic units associated with sound pressure level, sound power level, or acceleration level. See sound pressure level, for example.

dBA - Decibel, A-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to quiet sound levels. The resultant sound pressure level is therefore representative of the subjective response of the human ear. A-weighted sound pressure levels are denoted by the suffix 'A' (ie. dBA), and the term pressure is normally omitted from the description (i.e., sound level or noise level).



dBC - Decibel, C-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to loud sound levels. C-weighted sound pressure levels are denoted by the suffix 'C' (ie. dBC). C-weighted levels are often used in low-frequency noise analysis, as the filtering effect is nearly flat at lower frequencies.

dBL or dBLin - Decibel, Linear: The logarithmic units associated with a sound pressure level, where the sound pressure signal is unfiltered, and represents the full spectrum of incoming noise.

Calibrator (Acoustical): A device which produces a known sound pressure on the microphone of a sound level measurement system, and is used to adjust the system to standard specifications.

Directivity Factor (Q) (also, **Directional** or **Directionality Factor):** A factor mathematically related to Directivity Index, used in calculating propagated sound levels to account for the effect of reflecting surfaces near to the source. For example, for a source in free space where the sound is radiating spherically, Q = 1. For a source located on or very near to a surface (such as the ground, a wall, rooftop, etc.), where the sound is radiating hemispherically, Q = 2. This accounts for the additional sound energy reflecting off the surface, and translates into a +3 dB add.

Energy Equivalent Sound Level (L_{eq}): An energy-average sound level taken over a specified period of time. It represents the average sound pressure encountered for the period. The time period is often added as a suffix to the label (e.g., L_{eq}(24) for the 24-hour equivalent sound level). L_{eq} is usually A-weighted. An L_{eq} value expressed in dBA is a good, single value descriptor of the annoyance of noise.

Exceedance Noise Level (L_N): The noise level exceeded N% of the time. It is a statistical measure of the noise level. For highly varying sounds, the L_{90} represents the background noise level, L_{50} represents the median or typical noise level, and L_{10} represents the short term peak noise levels, such as those due to occasional traffic or a barking dog.

Far Field: Describes a region in free space where the sound pressure level from a source obeys the inverse-square law (the sound pressure level decreases 6 dB with each doubling of distance from the source). Also, in this region the sound particle velocity is in phase with the sound pressure. Closer to the source where these two conditions do not hold constitutes the "near field" region.

Free Sound Field (Free Field): A sound field in which the effects of obstacles or boundaries on sound propagated in that field are negligible.

Frequency: The number of times per second that the sine wave of sound or of a vibrating object repeats itself, now expressed in hertz (Hz), formerly in cycles per second (cps).

Hertz (Hz): Unit of measurement of frequency, numerically equal to cycles per second.

Human Perception of Sound: The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. The following table presents a general guideline.

Increase in Noise Level (dB)	Perception
3 or less	insignificant due to imperceptibility
4 to 5	just-noticeable difference
6 to 9	marginally significant
10 or more	significant, perceived as a doubling of sound exposure

Impact Sound: The sound produced by the collision of two solid objects, e.g., footsteps, dropped objects, etc., on an interior surface (wall, floor, or ceiling) of a building. Typical industrial sources include punch presses, forging hammers, etc.

Impulsive Noise: a) Single or multiple sound pressure peak(s) (with either a rise time less than 200 milliseconds or total duration less than 200 milliseconds) spaced at least by 500 millisecond pauses, b) A sharp sound pressure peak occurring in a short interval of time.

Infrasonic: Sounds of a frequency lower than 20 hertz.

Insertion Loss (IL): The arithmetic difference between the sound level from a source before and after the installation of a noise mitigation measure, at the same location. Insertion loss is typically presented as a positive number, i.e., the post-mitigation sound level is lower than the pre-mitigation level. Insertion loss is expressed in dB and is usually specified per 1/1 octave band, per 1/3 octave band, or overall.

Low Frequency Noise (LFN): Noise in the low frequency range, from infrasonic sounds (<20 Hz) up to 250 Hz.

Masking: a) The process by which the threshold of audibility for a sound is raised by the presence of another (masking) sound, or b) The amount by which the threshold of audibility of a sound is raised by the presence of another (masking) sound.

Near Field: The sound field very near to a source, where sound pressure does not obey the inverse-square law and the particle velocity is not in phase with the sound pressure.

Noise: Unwanted sound.

Noise Level: Same as Sound Level, except applied to unwanted sounds.

Peak Sound Pressure Level: Same as Sound Pressure Level except that peak (not peak-to-peak) sound pressure values are used in place of RMS pressures.

Quasi-Steady Impulsive Noise: Noise composed of a series of short, discrete events, characterized by rapid rise times, but with less than 0.5 seconds elapsing between events.

RMS Sound Pressure: The square-root of the mean-squared pressure of a sound (usually the result of an RMS detector on a microphone signal).

Reverberant Field: The region in a room where the reflected sound dominates, as opposed to the region close to the noise source where the direct sound dominates.

Sound: a dynamic (fluctuating) pressure.

Sound Exposure Level (SEL): An L_{eq} referenced to a one second duration. Also known as the Single Event Level. It is a measure of the cumulative noise exposure for a single event. It provides a measure of the accumulation of sound energy over the duration of the event.

Sound Intensity: The sound energy flow through a unit area in a unit time.

Sound Level Meter: An instrument comprised of a microphone, amplifier, output meter, and frequency-weighting networks which is used for the measurement of noise and sound levels.

Sound Pressure Level (SPL): The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P_0 is the reference pressure. P_0 is usually taken as 2.0×10^{-5} Pascals.

(1) SPL (dB) = $20 \log(P_{RMS}/P_0)$

Sound Power Level (PWL): The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W_0 is the reference power of 10^{-12} watts.

(2) PWL (dB) = $10 \log(W/W_0)$

Interrelationships between sound pressure level (SPL) and sound power level (PWL) depend on the location and type of source.

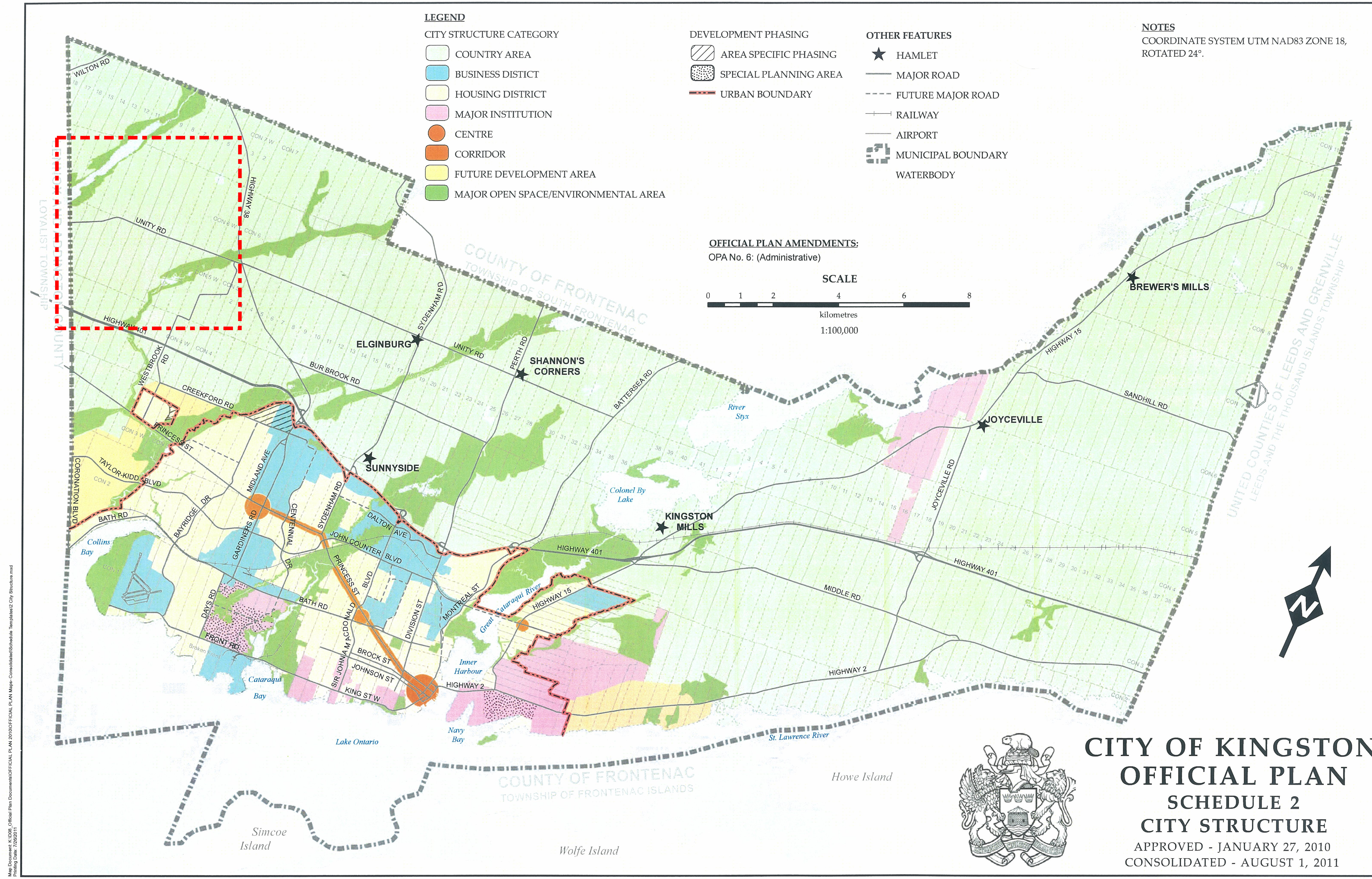
Spectrum: The description of a sound wave's resolution into its components of frequency and amplitude.

Speed (Velocity) of Sound in Air: 344 m/s (1128 ft/s) at 70°F (21°C) in air at sea level.

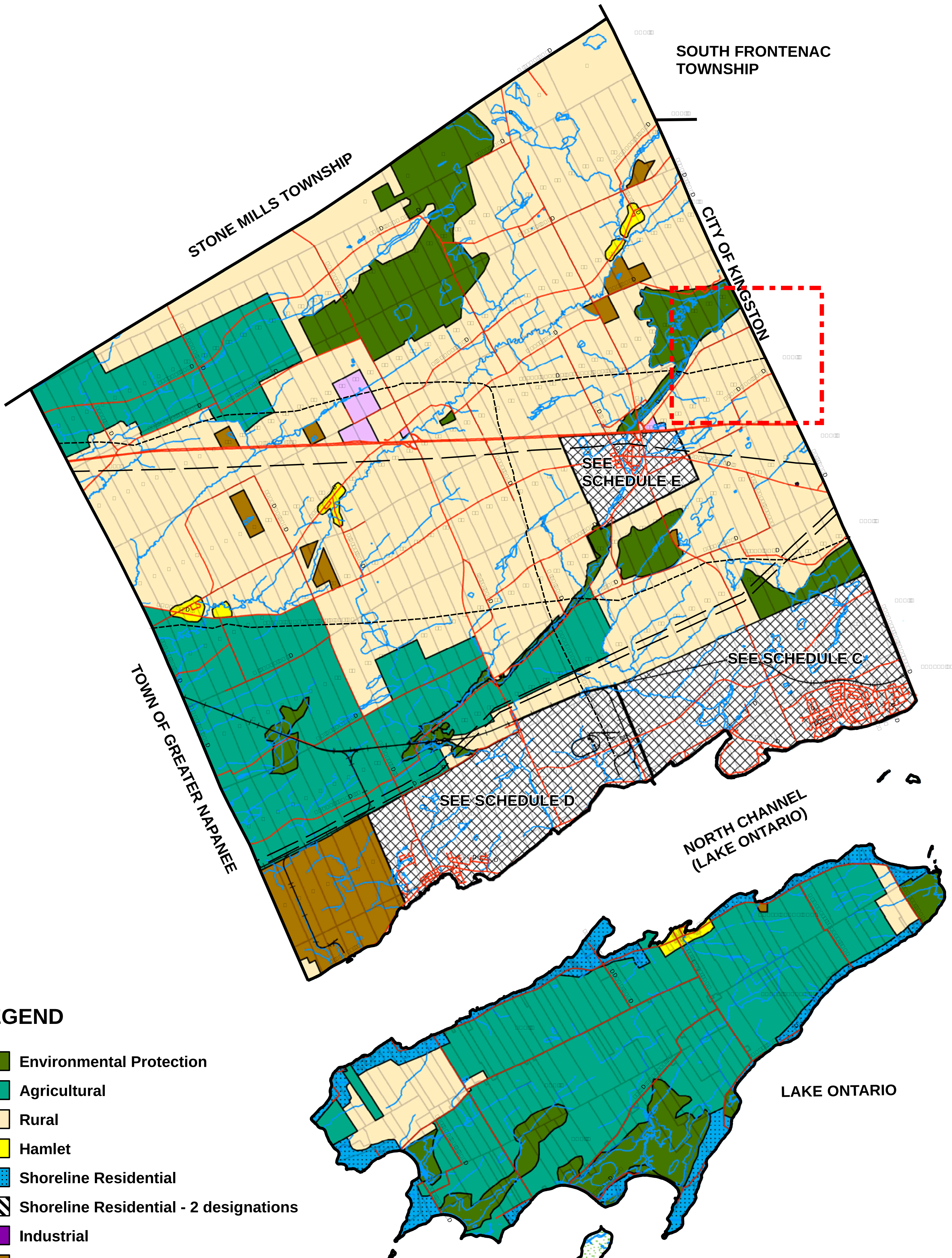
Threshold of Audibility (Threshold of Detectability): The minimum sound pressure level at which a person can hear a specified frequency of sound over a specified number of trials.

APPENDIX B

LAND-USE ZONING MAPS


LEGEND
CITY STRUCTURE CATEGORY
COUNTRY AREA
BUSINESS DISTICT
HOUSING DISTRICT
MAJOR INSTITUTION
CENTRE
CORRIDOR
FUTURE DEVELOPMENT AREA
MAJOR OPEN SPACE/ENVIRONMENTAL AREA
DEVELOPMENT PHASING
AREA SPECIFIC PHASING
SPECIAL PLANNING AREA
URBAN BOUNDARY
OTHER FEATURES
HAMLET
MAJOR ROAD
FUTURE MAJOR ROAD
RAILWAY
AIRPORT
MUNICIPAL BOUNDARY
WATERBODY
NOTES
COORDINATE SYSTEM UTM NAD83 ZONE 18, ROTATED 24°.
OFFICIAL PLAN AMENDMENTS:
OPA No. 6: (Administrative)
SCALE
0 1 2 4 6 8
kilometres
1:100,000
COUNTY OF FRONTENAC
TOWNSHIP OF SOUTH FRONTENAC
LOYALIST TOWNSHIP
UNITED COUNTIES OF LEEDS AND GRENVILLE
LEEDS AND THE THOUSAND ISLANDS TOWNSHIP
COUNTY OF FRONTENAC
TOWNSHIP OF FRONTENAC ISLANDS
ELGINBURG
SHANNON'S CORNERS
SUNNYSIDE
KINGSTON MILLS
JOYCEVILLE
BREWER'S MILLS
WILTON RD
UNITY RD
HIGHWAY 38
HIGHWAY 401
SYDENHAM RD
PERTH RD
BUR BROOK RD
WESTBROOK RD
CREEKFORD RD
PRINCESS ST
TAYLOR-KIDD BLVD
CORONATION BLVD
BATH RD
BAYRIDGE DR
MIDLAND AVE
GARDINERS RD
CENTENNIAL DR
SYDENHAM RD
JOHN COUNTER BLVD
DALTON AVE
SIR JOHN A MACDONALD BLVD
DIVISION ST
MONTREAL ST
DAYS RD
FRONT RD
BROCK ST
JOHNSON ST
KING ST W
HIGHWAY 2
HIGHWAY 15
BATTERSEA RD
JOYCEVILLE RD
SANDHILL RD
MIDDLE RD
River Styx
Colonel By Lake
Collins Bay
Cataraqui Bay
Great Cataraqui River
Inner Harbour
Navy Bay
Lake Ontario
St. Lawrence River
Howe Island
Simcoe Island
Wolfe Island
N
CITY OF KINGSTON
OFFICIAL PLAN
SCHEDULE 2
CITY STRUCTURE
APPROVED - JANUARY 27, 2010
CONSOLIDATED - AUGUST 1, 2011

Loyalist Township Official Plan - Schedule A
Land Use Plan



LEGEND

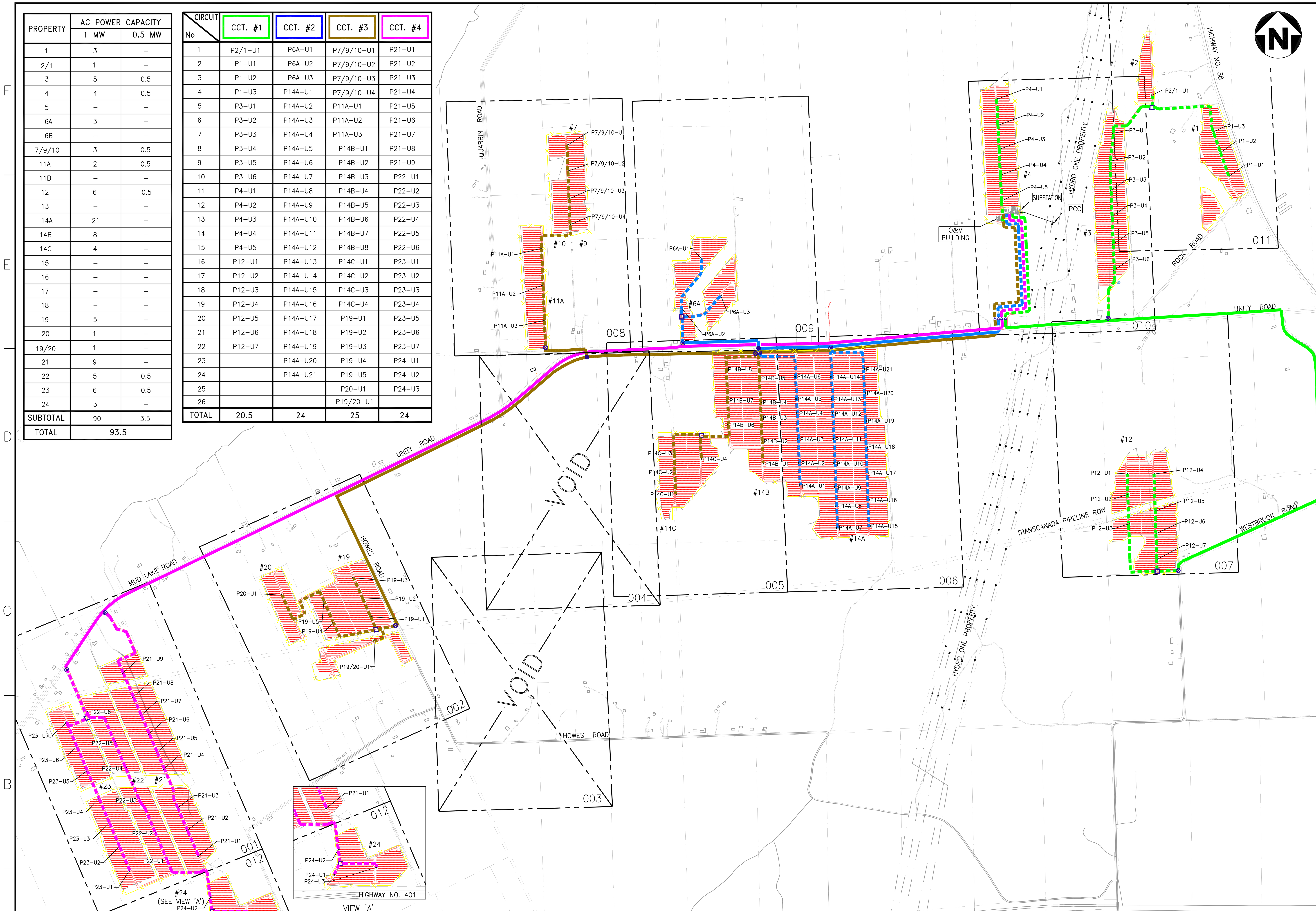
- Environmental Protection
- Agricultural
- Rural
- Hamlet
- Shoreline Residential
- Shoreline Residential - 2 designations
- Industrial
- Aggregate
- Resort Commercial
- Open Space
- Urban Area

APPENDIX C

PROJECT LAYOUT AND DRAWINGS

PROPERTY	AC POWER CAPACITY	
	1 MW	0.5 MW
1	3	–
2/1	1	–
3	5	0.5
4	4	0.5
5	–	–
6A	3	–
6B	–	–
7/9/10	3	0.5
11A	2	0.5
11B	–	–
12	6	0.5
13	–	–
14A	21	–
14B	8	–
14C	4	–
15	–	–
16	–	–
17	–	–
18	–	–
19	5	–
20	1	–
19/20	1	–
21	9	–
22	5	0.5
23	6	0.5
24	3	–
SUBTOTAL	90	3.5
TOTAL	93.5	

CIRCUIT / No	CCT. #1	CCT. #2	CCT. #3	CCT. #4
1	P2/1–U1	P6A–U1	P7/9/10–U1	P21–U1
2	P1–U1	P6A–U2	P7/9/10–U2	P21–U2
3	P1–U2	P6A–U3	P7/9/10–U3	P21–U3
4	P1–U3	P14A–U1	P7/9/10–U4	P21–U4
5	P3–U1	P14A–U2	P11A–U1	P21–U5
6	P3–U2	P14A–U3	P11A–U2	P21–U6
7	P3–U3	P14A–U4	P11A–U3	P21–U7
8	P3–U4	P14A–U5	P14B–U1	P21–U8
9	P3–U5	P14A–U6	P14B–U2	P21–U9
10	P3–U6	P14A–U7	P14B–U3	P22–U1
11	P4–U1	P14A–U8	P14B–U4	P22–U2
12	P4–U2	P14A–U9	P14B–U5	P22–U3
13	P4–U3	P14A–U10	P14B–U6	P22–U4
14	P4–U4	P14A–U11	P14B–U7	P22–U5
15	P4–U5	P14A–U12	P14B–U8	P22–U6
16	P12–U1	P14A–U13	P14C–U1	P23–U1
17	P12–U2	P14A–U14	P14C–U2	P23–U2
18	P12–U3	P14A–U15	P14C–U3	P23–U3
19	P12–U4	P14A–U16	P14C–U4	P23–U4
20	P12–U5	P14A–U17	P19–U1	P23–U5
21	P12–U6	P14A–U18	P19–U2	P23–U6
22	P12–U7	P14A–U19	P19–U3	P23–U7
23		P14A–U20	P19–U4	P24–U1
24		P14A–U21	P19–U5	P24–U2
25			P20–U1	P24–U3
26			P19/20–U1	
TOTAL	20.5	24	25	24



NOTES

1. FOR DETAILS REFER TO DRAWINGS LYD-0002-001 TO LYD-0002-011.

LEGEND

- 1MW/0.5MW INVERTER STATION
- SOLAR PANEL TABLE (5x4 PANELS)
- DEVELOPMENT BOUNDARY
- ACCESS ROAD
- PROPERTY LINE
- UNDERGROUND COLLECTOR SYSTEM (CIRCUIT 1)
- OVERHEAD COLLECTOR SYSTEM JOINT USE WITH HONI (CIRCUIT 1)
- UNDERGROUND COLLECTOR SYSTEM (CIRCUIT 2)
- OVERHEAD COLLECTOR SYSTEM JOINT USE WITH HONI (CIRCUIT 2)
- UNDERGROUND COLLECTOR SYSTEM (CIRCUIT 3)
- OVERHEAD COLLECTOR SYSTEM JOINT USE WITH HONI (CIRCUIT 3)
- UNDERGROUND COLLECTOR SYSTEM (CIRCUIT 4)
- OVERHEAD COLLECTOR SYSTEM JOINT USE WITH HONI (CIRCUIT 4)
- 1 MW ZONE
- PCC — POINT OF COMMON COUPLING
- PXX–ZX — P: PROPERTY Z: ZONE
- PXX–UX — P: PROPERTY U: INVERTER UNIT
- DISCONNECT SWITCH AND LIGHTNING ARRESTORS
- CABLE TERMINATION AND LIGHTNING ARRESTORS
- OVERHEAD COLLECTOR SYSTEM CONNECTION POINT
- 34.5kV JUNCTION BOX

0m 100 200 300 400 500
1:10000

PRELIMINARY

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
2	25APR12	ISSUED FOR CLIENT REVIEW	RS	IB	DJ			
1	14FEB12	RE-ISSUED FOR USE	RS	IB	SC			
0	15DEC11	ISSUED FOR USE	RS	IB	MP	SC		
B	06DEC11	ISSUED FOR CLIENT REVIEW	RS	IB	MP	SC		
A	05DEC11	ISSUED FOR SQUAD CHECK	RS	IB	MP	SC		

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CONCEPTUAL DRAWING ONLY
NOT TO BE USED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE: PRELIMINARY

AREA

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
168335		DSN	IB	NOV'11
		DRN	RS	NOV'11
SCALE	PACKAGE CODE	CHK	MP	NOV'11
1:10000		APP	SC	NOV'11

SUBJECT
SOL–LUCE KINGSTON ENERGY PROJECT
SITE PLAN & COLLECTOR LINE LAYOUT

CLIENT DWG. NO.

DRAWING NO. 168335–0002–141–LYD–0001–001

REV. 2

P:\CAD\ELE\MF\168335-0002-141-LYD-0001-001.DWG

PLOTTED: 25–Apr–12 1:07 PM USER: SHAHBAZIAN, RAZMIK
SAVED: 25–Apr–12 1:06 PM

APPENDIX D

MANUFACTURER'S SPECIFICATIONS

ABB

Transformer Performance Specification

For: Amec | Date: 8/24/2011
Quote: 10Q1325733 | Item: 10 | Spec:

Rating								
Type	Substation Non-Auto	Class	H Winding		X Winding		Y Winding	
Phase	3		240	kV	34.5	kV	-	
Hertz	60	ONAN	65000	KVA	65000	KVA	-	KVA
Temp Rise	65 C	ONAF	85000	KVA	85000	KVA	-	KVA
Insulating Type	Mineral Oil	ONAF	110000	KVA	110000	KVA	-	KVA

Additional Tap Voltages	
H Winding (kV)	+16 , -16 x 1.25%, OLTC Full Capacity Below Nominal
X Winding (kV)	No Taps
Y Winding ()	-

Connections for Operation									
Transformers in Bank	To Transform from	Phase	Connected	To Transform from	Phase	Connected	To Transform To	Phase	Connected
1	240 kV	3	Wye	34.5 kV	3	Delta	-	3	-

Dielectric Tests			
Applied Voltage (To other windings and ground)	H Winding	95	kV
	X Winding	95	kV
	Y Winding	-	kV
Induced Voltage	Enhancement level / 7200 Cycle (L-G)	360	kV
	One hour level (L-G)	315	kV

Insulation Levels	
ITEMS	Basic Lightning Impulse Insulation Level (BIL kV)
H line	900
H neutral	250
X line	250
X neutral	-
Y line	-

Loss Data based on	NL @ 20C, LL @ 85C				
Based on loading at	240 kV	To	34.5 kV		
Winding Load KVA	H	110000	X	110000	Y
No Load Loss	60 kW	Load Losses	116.3 kW		
		Total Loss	333 kW		

Regulation at		
240 kV	/	34.5 kV
110000		KVA
Power Factor	% Reg	% Load
1.0	1.03	100
0.8	7.69	100

Auxiliary Losses (Not included in above)	Percent Exciting Current	
	100% V	110% V
4.5 kW	0.08	0.20

Average Sound Level	
dB(A)	Class
81	ONAN
83	ONAF
84	ONAF

Percent Impedance Voltage		
% IZ	Between Windings	At KVA
7	HV-LV	65000

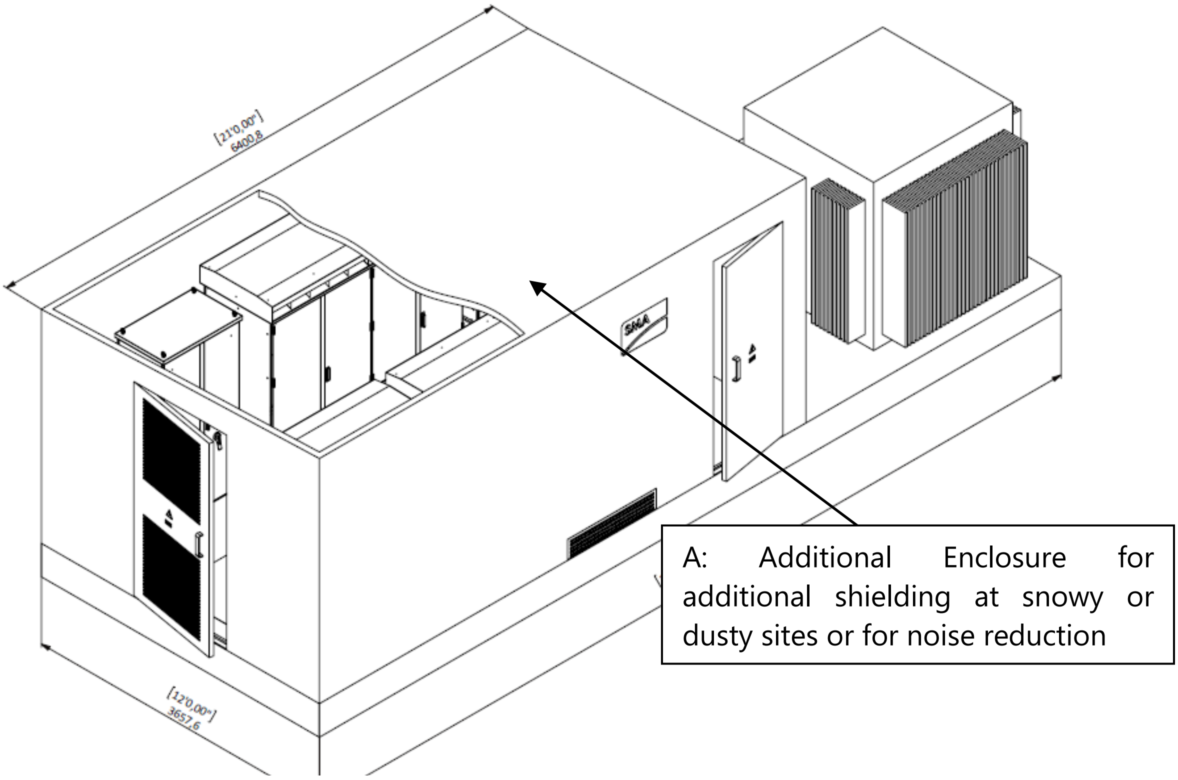
Mechanical Data
Not for Construction Purposes

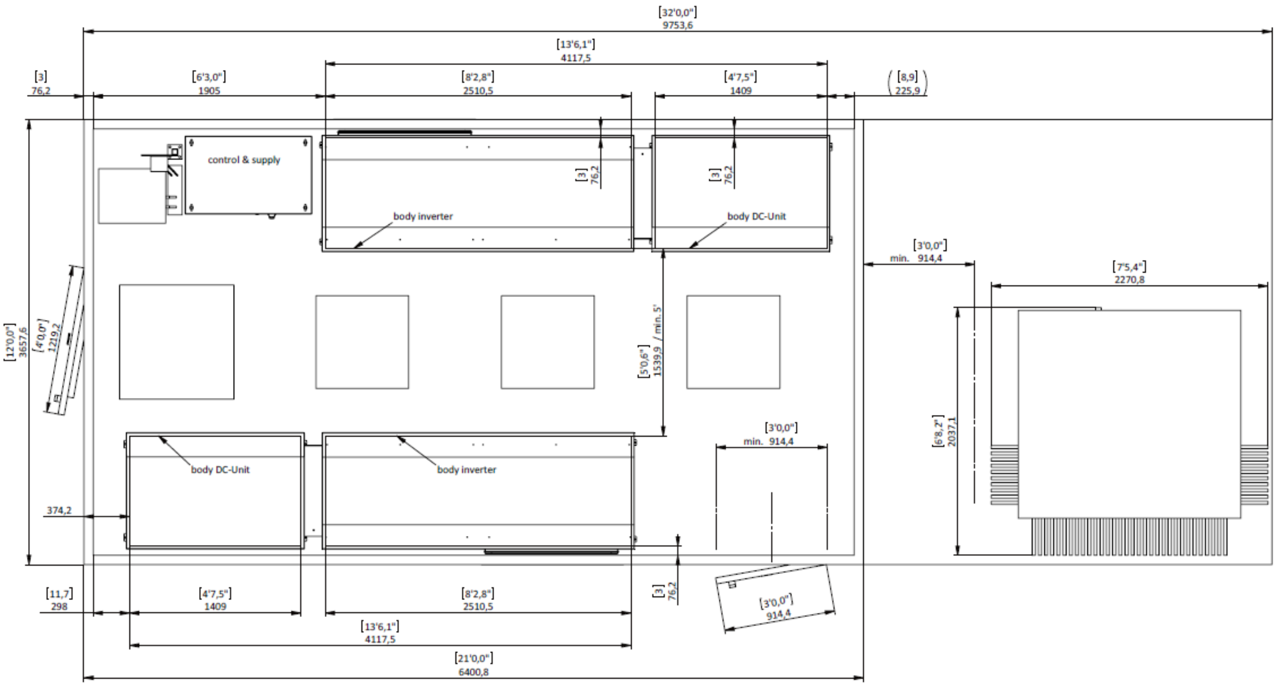
Drawing		
Height	(A)	336 in
Length	(B)	388 in
Width	(C)	228 in
Height over Cover	(D)	187 in
Untanking (Plus Slings)	(E)	331 in
Shipping Height		189 in
Shipping Width		124 in
Shipping Length		292 in
Oil Preservation		Cops
Weights (approximate) (lbs)		
Core and Coils		167924 lbs
Tank and Fittings		63094 lbs
Fluid	14952 gal	112140 lbs
Total Weight		343179 lbs
Untanking Weight		167924 lbs
Shipping Weight		205407 lbs
Shipped in		Dry Air

3.2.2 Additional Mechanical Requirements for Option "Enclosure"

Item	Description	Specification	Comment
1	Dimensions of MV-PP with enclosure	Compliance with drawings	See drawing 65-1518502002 65-1518507002 65-1518505002 65-1518513002 65-1518517002 65-1518515002
2	Enclosure design	The enclosure comprises a weather-tight structure of steel walls and roof. The interior walls are sheathed. The enclosure is permanently connected to the main steel frame. The roof pitch is 2°.	See drawing 65-1518507002 65-1518517002
3	Material	Enclosure framework: Painted steel Indoor wall panels: Galvanized sheet Outdoor wall panels: Galvanized and painted steel Roof panels: Galvanized and painted steel Louvers: Aluminum	
4	Insulation	The walls and the roof of the enclosure are to be insulated by mineral wool or fiber glass batting to reduce external heating and noise pollution. Thermal performance: R-value: 6 Thickness: 51 mm (2 inch) Low flammability Non containing asbestos Non-wicking	
5	Entrance and exit	The enclosure has two doors with left hinge to open outwards: On the short side of the enclo-	See drawing 65-1518505002

Enclosure MV Power Platform including Disconnect Units



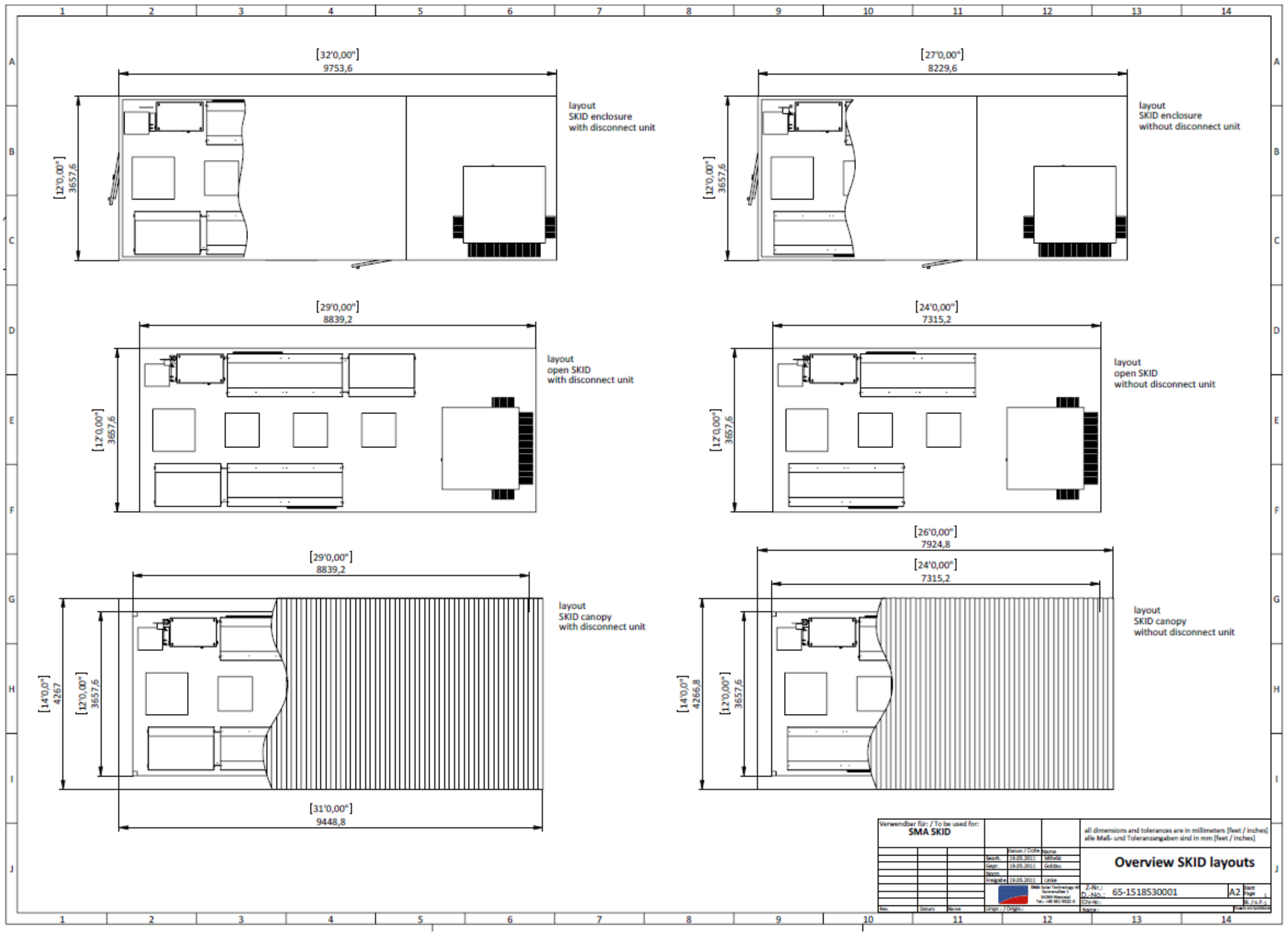


1.1.2 Compliance Standards

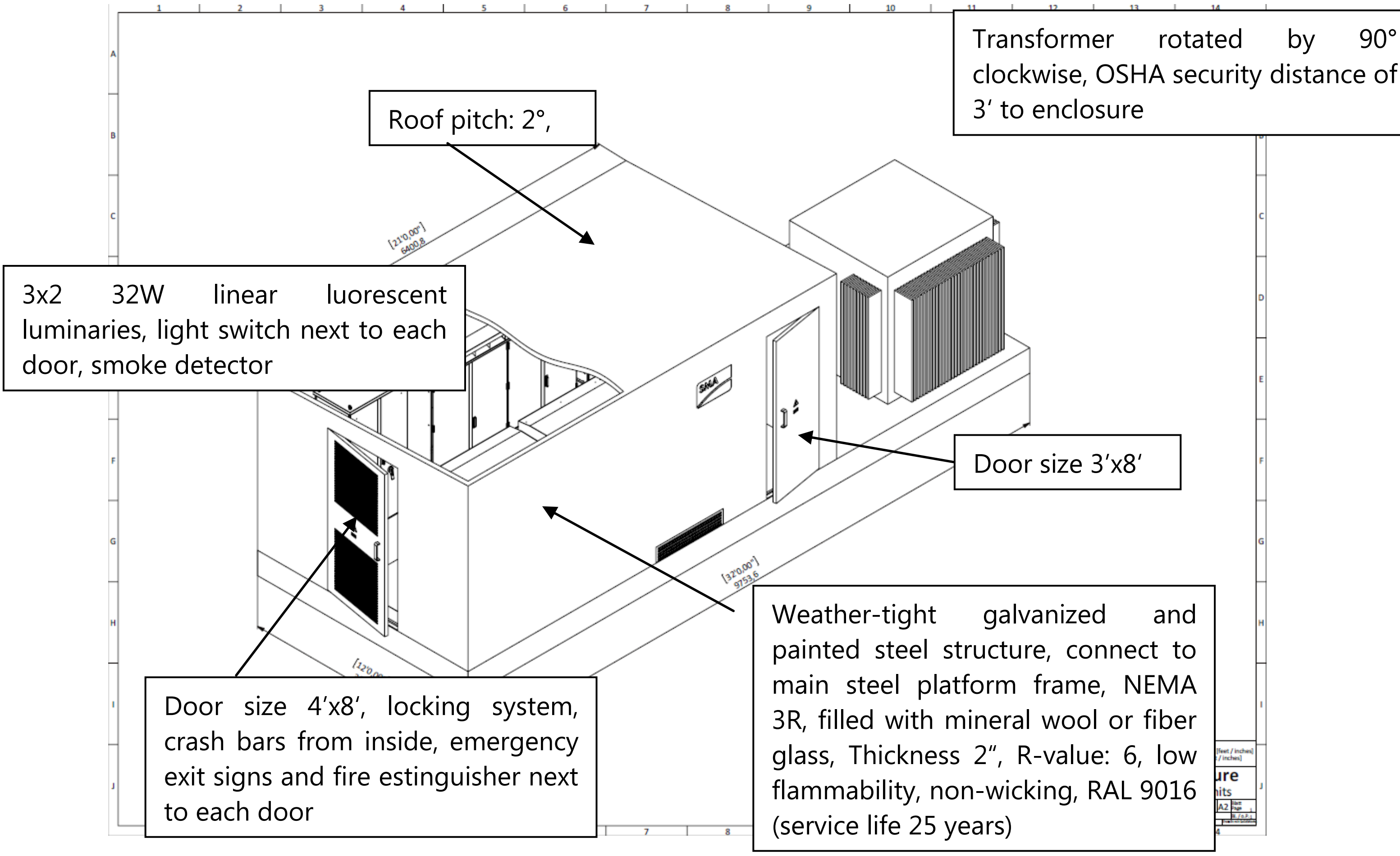
Standard	Name	Index
ANSI/ IEEE	American National Standards Institute / Institute of Electrical and Electronics Engineers	**ANSI** A117.1, 2009 Edition : Accessible and Usable Buildings and Facilities
ASCE	American Society of Civil Engineers	ASCE/SEI 7-05
ASTM	American Society for Testing and Materials	- ASTM A36/A36M - Standard Specification for Carbon Structural Steel - ASTM A90IA90M - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings - ASTM A525 - Standard Specifications for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process - ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Testing Apparatus - ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints - ASTM D 1654 - Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments - ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates - ASTM E 84-04 - Standard Test Method for Surface Burning Characteristics of Building Materials National Fire Protection Association (NFPA)
AWS	American Welding Society	ANSI/AWS 2009
IBC	International Building Code	International Building Code (IBC), 2009 Edition
IEC	International Electrotechnical Commission	IEC 2000
ISA	Instrumentation Society of America	ISA Documentation Standards and User Resources for Industrial Automation and Control Systems, 2nd Edition
NEC	National Electrical Code	2008 and 2011
NEMA	National Electrical Manufacturers Association	NEMA Standards Publication 250-1997
NESC	National Electrical Safety Code	NESC 2007
NETA	National Electrical Testing Association	ANSI/NETA ATS-2009
NFPA	National Fire Protection Association	- NFPA 70 - National Electrical Code (NEC) - NFPA 70E – Standard for Electrical Safety in the Workplace - NFP A 101 - Life Safety Code - NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials - NFP A 496 - Standard for Purged and Pressurized Enclosures for Electrical Equipment
OSHA	Occupational Safety and Health Administration	OSHA 1910
UL	Underwriters Laboratories	UL 2009
UMC	Uniform Mechanical Code	2009 Uniform Mechanical Code

1.2 Mechanics

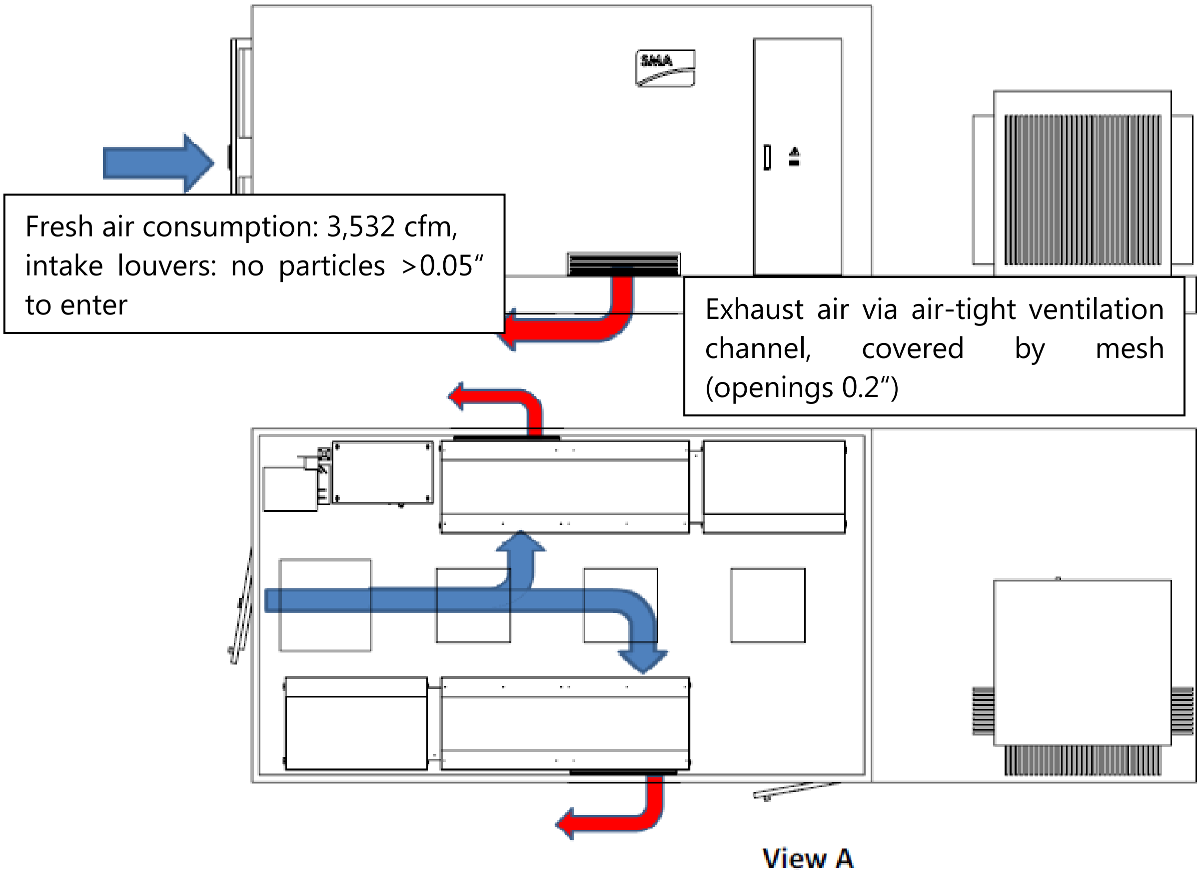
Overall dimensions:



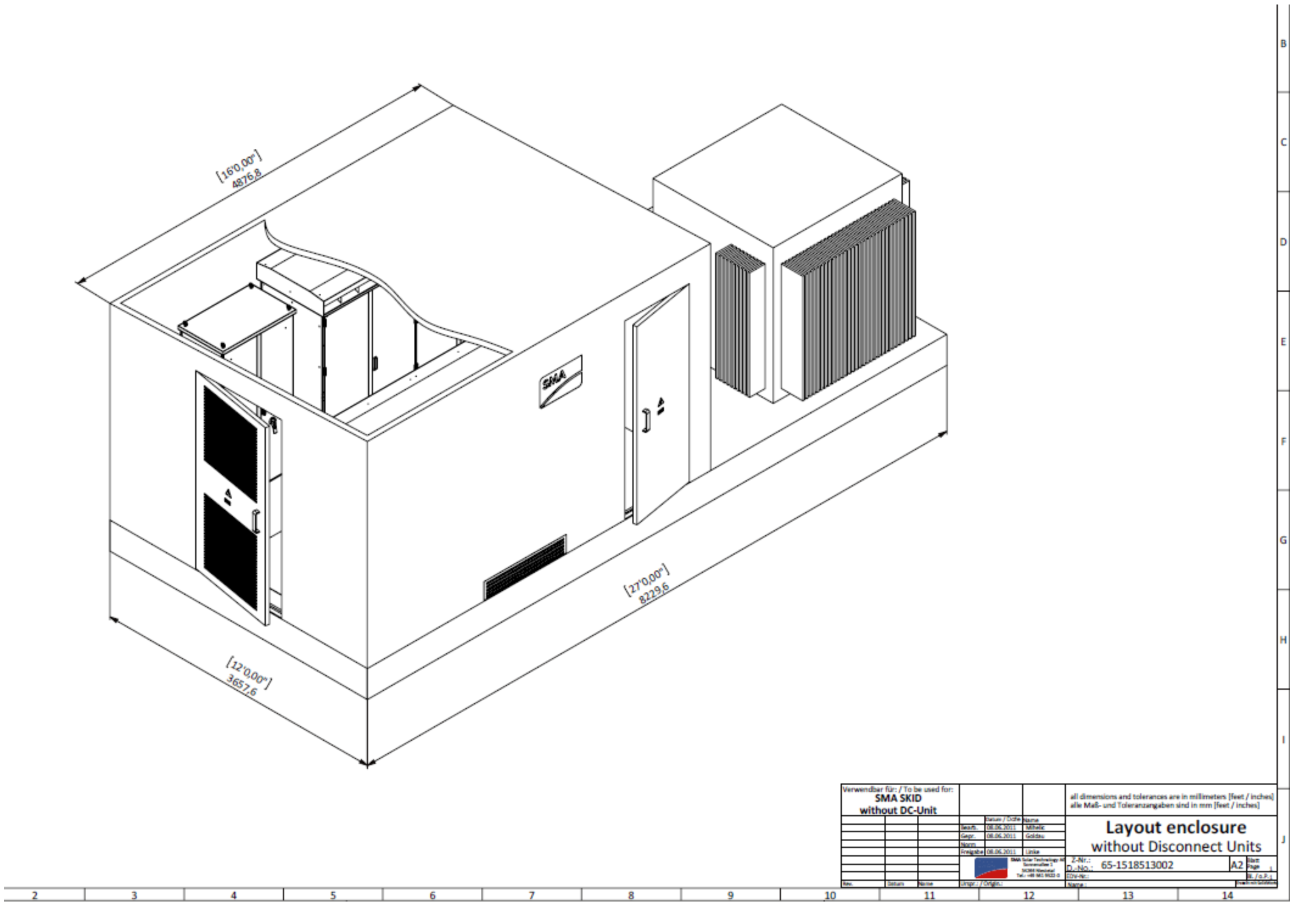
1.2.1 itional Enclosure platform mechanics With Disconnect Units:



Air flow:


Fresh air consumption: 3,532 cfm, intake louvers: no particles >0.05" to enter
Exhaust air via air-tight ventilation channel, covered by mesh (openings 0.2")
View A

Without Disconnect Units:

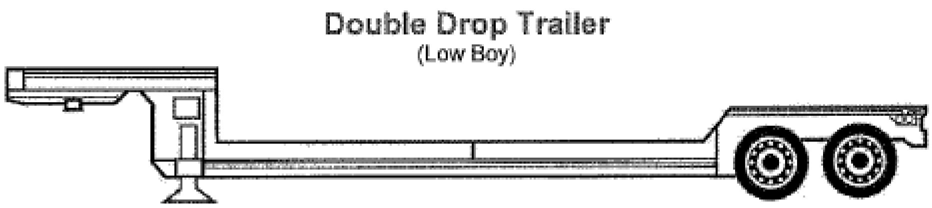


1.3 Transportation and Installation

1.3.1 Transport:

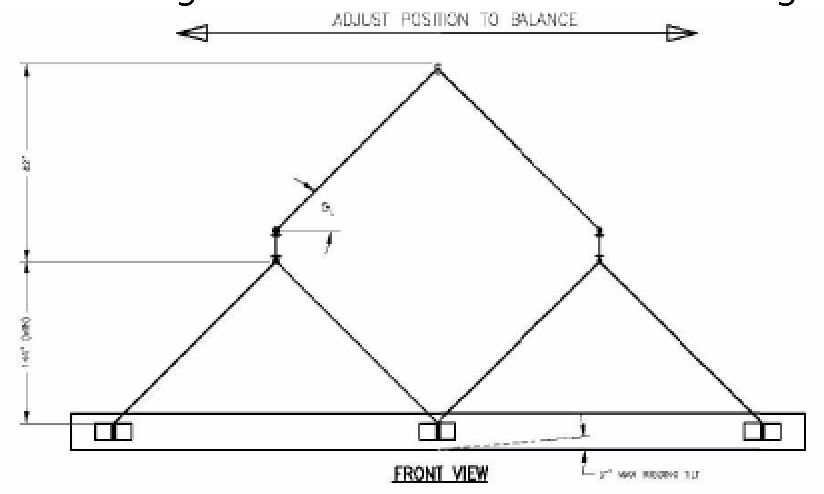
- MV Power platform is delivered ex works including loading
- Optional delivery to site possible
- (...text from installation requirements that has already been set up)

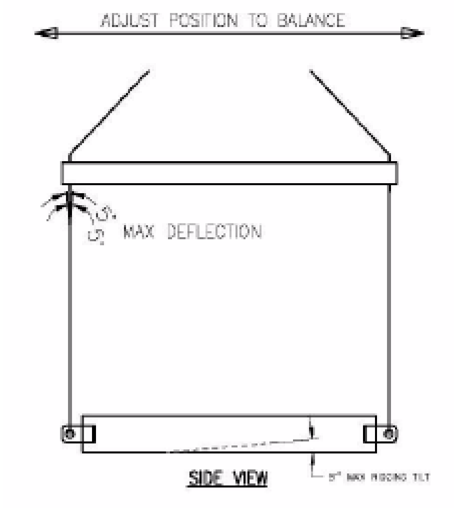
  Truck has to be a Double Droop Trailer (low boy) suitable to carry the weight and dimensions (especially width and height) of the MV Power Platform.



Unloading:

- 6 lifting lugs are included upon delivery which have to be assembled to the frame prior to unloading procedure
- The customer has to organize an appropriate crane to lift the MV Power Platform. Please contact a crane supplier to identify the required crane properties.
- Lifting to be done as shown in the drawings below

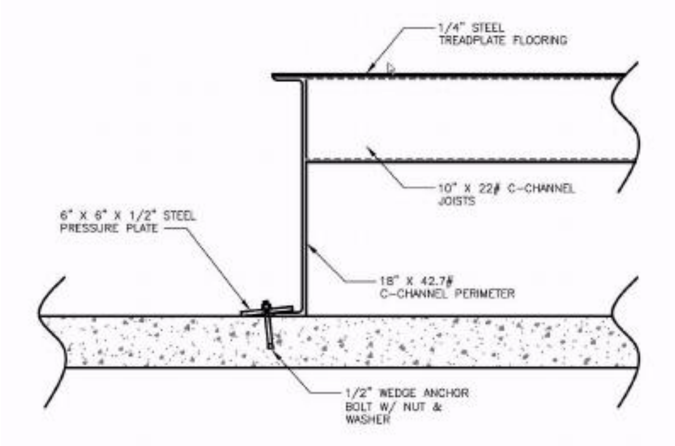


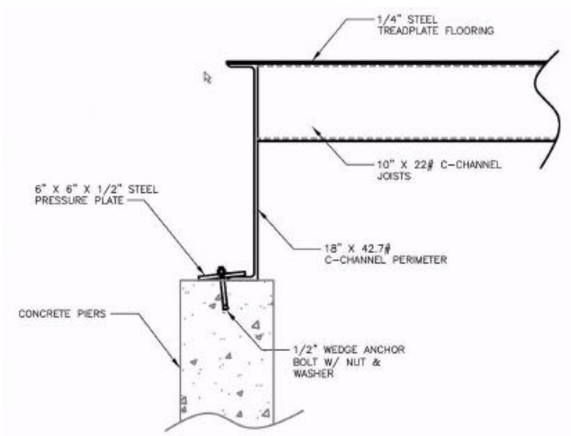


1.3.2 Installation:

Mechanical:

- Soil must be suitable and hard enough to carry the weight of the MVPP
- Typical mounting is done on concrete piers od a concrete pad, regards ACI-guidelines and regulations for concrete basement design



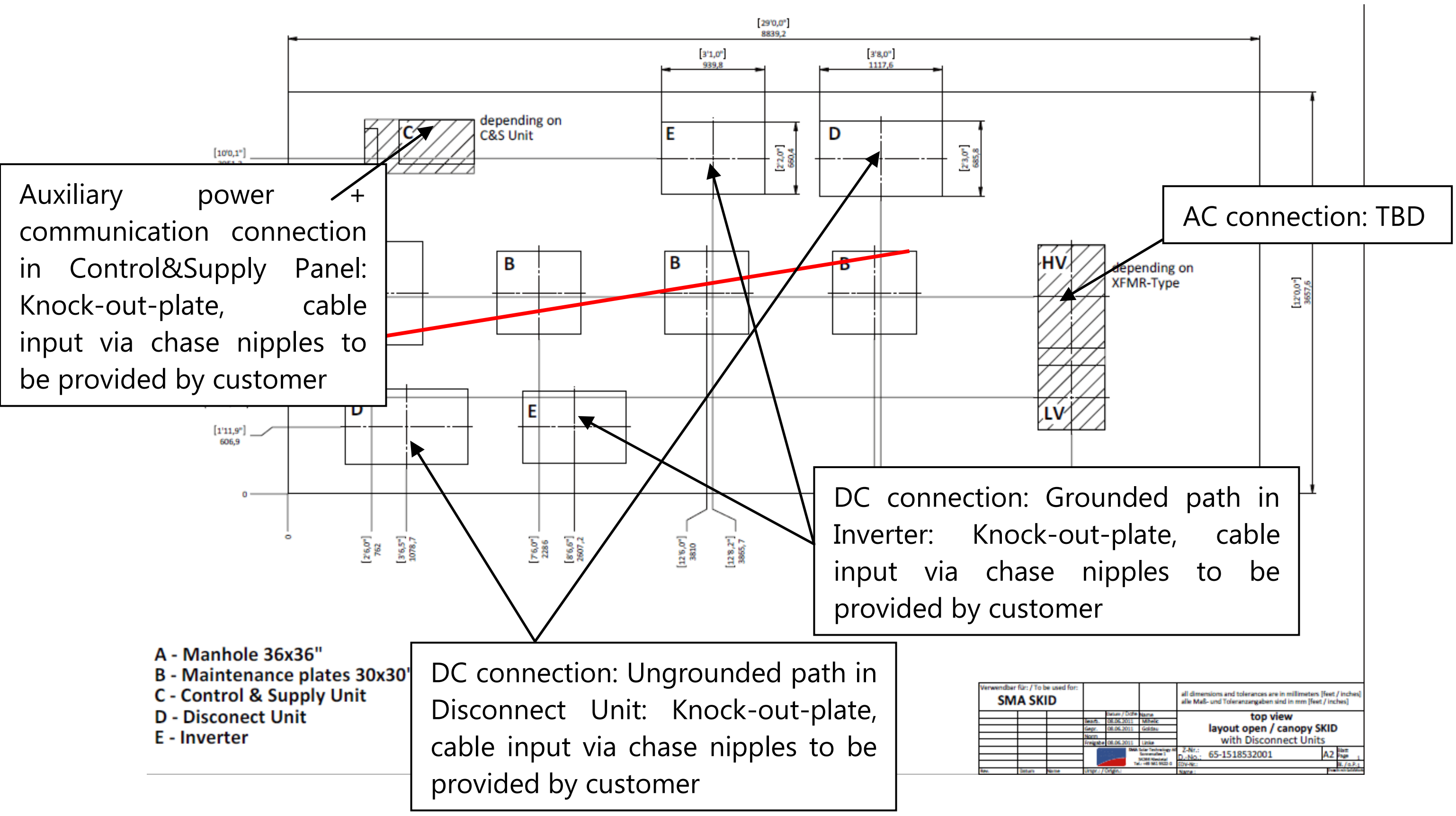


- MVPP frame has to be connected via wedge anchors and pressure plates. Both are included upon delivery
- Maximum pier height is 3′ to ensure seismic zone 4 rating of whole system assembly (MVPP including mounting)
  (DANGER and details from inst. Requ.)

Electrical connection:

- Pad mounting: All cables to be conducted through pad, appropriate sealing to be applied by customer.
- Pier mounting: All cables to be lead to the platform bottm via metal conduits. Refer to NFPA 70 for details. Conduit length has to include pier height + 15” power platform frame height.

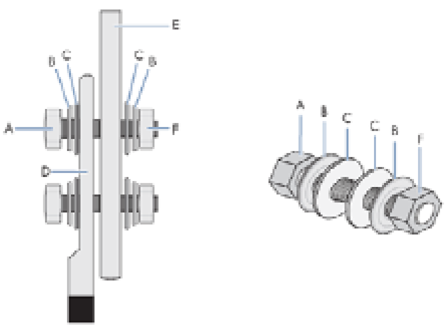
With Disconnect Unit



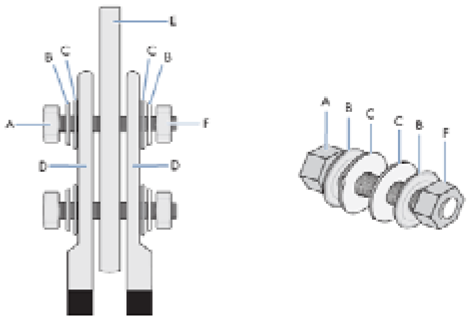
Without Disconnect Unit

(new drawing: same as above without Disconnect Unit openings, DC connection all in inverter)

- The DC connection has to be done in accordance to the installation manual of the Disconnect Unit and the inverter. Connection can be done via cable lugs only. The screws and washers are included upon delivery, ths customer has to provide appropriate cabel lugs. See installation manual of inverters for details.



Position	Description
A	Screw head - size: M 12
B	Belleville / Conical Washer
C	Washer
D	Cable lug
E	Busbar
F	Nut - size: M 12



Position	Description
A	Screw head - size: M 12
B	Belleville / Conical Washer
C	Washer
D	Cable lug
E	Busbar
F	Nut - size: M 12

- The auxiliary power and communication cable connection has to be done in accordance to the MVPP installation manual. Refer to this manul for details.TBD
- The AC connection to the MV transformer has to be done in accordance to the MVPP installation manual. Refer to this manual for details. TBD

MV POWER PLATFORM 1.0 / 1.25 / 1.4 / 1.5 / 1.6 MW

Turnkey

- Modular power solution allows for rapid field deployment
- Conversion, distribution and control functions included
- Customizable service options

Innovative

- Based on award-winning SMA Sunny Central technology
- Leading grid management functions available

Secure

- Renowned SMA manufacturing standards ensure long term operation
- Diverse service options address project-specific needs

Flexible

- Available as an open platform, with a canopy shade or as a full steel enclosure
- Can be installed on a concrete slab, piers or vault

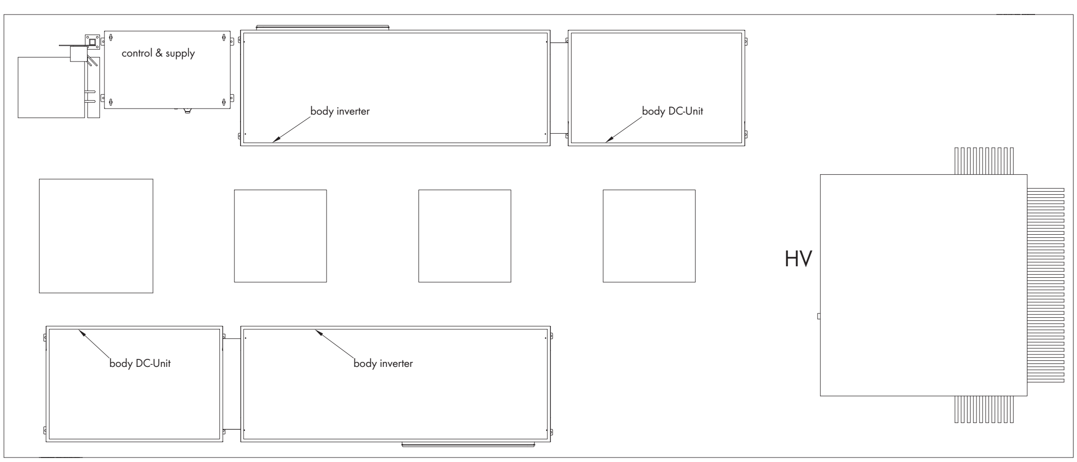
MV POWER PLATFORM 1.0 / 1.25 / 1.4 / 1.5 / 1.6 MW

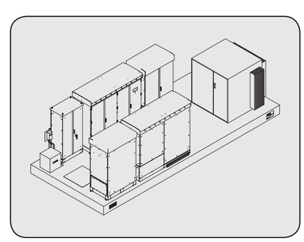
Modular utility-scale power solution

The SMA MV Power Platform—available as an open, shaded or enclosed structure—provides the most cost-effective way to modularly install large-scale PV power converters. These 1.0 – 1.6 megawatt medium-voltage turnkey power solutions include two Sunny Central inverters; a medium-voltage transformer; optional DC or AC/DC disconnect cabinets; and a control and supply panel for power distribution to local loads and (optionally) field tracker motors. They also feature easy integration with installer SCADA equipment; a modular, steel base with all component interconnection cabling; and a convenient plug-and-play installation scheme. Designed for Seismic Zone D applications, all configurations can be deployed for temperatures down to -40 °C. Each configuration can also be installed on a concrete slab, vault or piers for maximum flexibility.

Technical data	SAMPLE CONFIGURATIONS			
	MVPP 1.0 MW		MVPP 1.5 MW	MVPP 1.6 MW
	600 V DC	1000 V DC	1000 V DC	1000 V DC
Input (DC)				
Max. DC power	1013 kW	1120 kW	1796 kW	1796 kW
MPP voltage range (@77°F/122°F at 60Hz)	330 V ... 600 V / 330 V ... 600 V a)	449 V ... 820 V / 436 V ... 820 V a)	609 V ... 820 V / 554 V ... 820 V a)	641 V ... 820 V / 583 V ... 820 V a)
Rated input voltage	380 V	480 V	595 V	620 V
Max. DC voltage	600 V	1000V / 1100 V b)	1000V / 1100 V b)	1000V / 1100 V b)
Max. DC input current	3200 A	2500 A	2800 A	2800 A
Number of independent MPP inputs	2	2	2	2
Number of fused DC inputs	18	18 / 64 (Optiprotect)	18 / 64 (Optiprotect)	18 / 64 (Optiprotect)
Output (AC)				
Nominal AC power	1000 kVA @113 °F	1000 kVA @122 °F	1500 kVA @122 °F	1600 kVA @122 °F
Maximum AC power	1000 kVA @113 °F	1100 kVA @77 °F	1650 kVA @77 °F	1760 kVA @77 °F
Nominal AC voltage options	12.47 kV; 13.8 kV; 20.6 kV; 24.9 kV; 27.6 kV; 34.5 kV	12.47 kV; 13.8 kV; 20.6 kV; 24.9 kV; 27.6 kV; 34.5 kV	12.47 kV; 13.8 kV; 20.6 kV; 24.9 kV; 27.6 kV; 34.5 kV	12.47 kV; 13.8 kV; 20.6 kV; 24.9 kV; 27.6 kV; 34.5 kV
Total Harmonic Distortion of grid current	< 3 % @ nominal power	< 3 % @ nominal power	< 3 % @ nominal power	< 3 % @ nominal power
Grid frequency	60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Power factor (adjustable)	0.90_{lead} - 0.90_{lag}	0.90_{lead} - 0.90_{lag}	0.90_{lead} - 0.90_{lag}	0.90_{lead} - 0.90_{lag}
Transformer vector group	Dy1y1	Dy1y1	Dy1y1	Dy1y1
Transformer no load taps	±2.5 % & ±5.0 %	±2.5 % & ±5.0 %	±2.5 % & ±5.0 %	-5.0 %; -2.5 %; +3.5 %; +7.0 %; +10.5 %; +14.0 % c)
Transformer cooling type	KNAN	KNAN	KNAN	KNAN
Power consumption				
Internal consumption in operation (inverter + MV-transformer)	< 3400 VA + < 12 kVA	< 3000 VA + < 12 kVA	< 3000 VA + < 19.2 kVA	< 3000 VA + < 19.2 kVA
Standby consumption (inverter + MV-transformer)	< 220 VA + < 1500 VA	< 200 VA + < 1500VA	< 200 VA + < 2200 VA	< 200 VA + < 2200 VA
Supply via internal PV power /external power supply / green power	○ / ○ / ●	○ / ○ / ●	○ / ○ / ●	○ / ○ / ●
External auxiliary supply voltage	208 V; 480 V; 600 V	208 V; 480 V; 600 V	208 V; 480 V; 600 V	208 V; 480 V; 600 V
Efficiency				
Max. efficiency / European efficiency / CEC efficiency inverter	98.60% / 97.90% / 98.00%	98.60% / 98.40% / 98.50%	98.60% / 98.40% / 98.50%	98.60% / 98.40% / 98.50%
Max. efficiency / European efficiency / CEC efficiency transformer	TBD / TBD / TBD	TBD / TBD / TBD	TBD / TBD / TBD	TBD / TBD / TBD

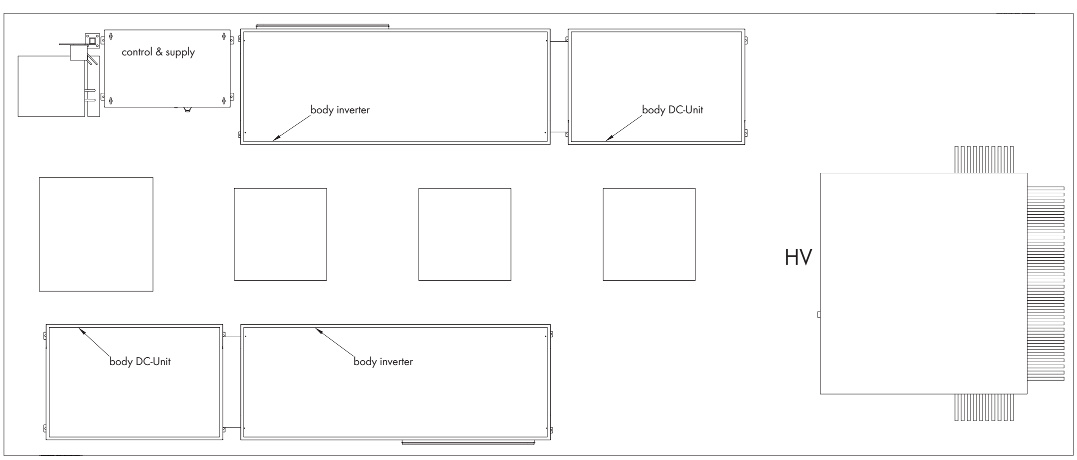
OPEN CONFIGURATION

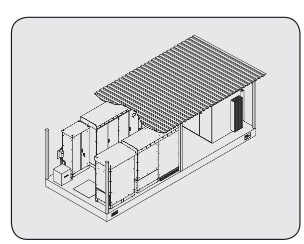




Technical data	SAMPLE CONFIGURATIONS			
	MVPP 1.0 MW		MVPP 1.5 MW	MVPP 1.6 MW
	600 V DC	1000 V DC	1000 V DC	1000 V DC
Protection rating and ambient conditions				
Protection rating	NEMA 3R	NEMA 3R	NEMA 3R	NEMA 3R
Operation temperature range @ nominal power	-13 °F ... +113 °F	-4°F ... +122°F	-4°F ... +122°F	-4°F ... +122°F
Storage temperature standard / low temperature option	-13°F ... +140°F / -40°F ... +140°F	-4°F ... +140°F / -40°F ... +140°F	-4°F ... +140°F / -40°F ... +140°F	-4°F ... +140°F / -40°F ... +140°F
Relative humidity	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Snow load (psf)	>40	>40	>40	>40
Wind load (mph)	>110	>110	>110	>110
Fresh air consumption (CFM)	3531.6	3531.6	3531.6	3531.6
Max. altitude above sea level (m)	2000	2000	2000	2000
Design lifetime (years)	>20	>20	>20	>20
Compliance and certificates				
Seismic rating according UBC sec. 1632 and IBC sec. 1613[d)]	Site class D, Ss =2.0g, S1=1.0g	Site class D, Ss =2.0g, S1=1.0g	Site class D, Ss =2.0g, S1=1.0g	Site class D, Ss =2.0g, S1=1.0g
NEC 2011 / OSHA 1910	● / ●	● / ●	● / ●	● / ●
PE certificate on mechanical, electrical, seismic for California / other state	● / ○	● / ○	● / ○	● / ○
Features				
Disconnect Unit	○	○	○	○
AC circuit breakers located in inverter / Disconnect Unit	● / ○	● / ○	● / ○	● / ○
Project specific power supply for tracker motors etc.	○	○	○	○
Auxiliary power fusible disconnect switch / overvoltage protection	● / ○	● / ○	● / ○	● / ○
Customer SCADA system compartment [e)]	34" x 30" x 12", Supply: 120V/60Hz/max 250W	34" x 30" x 12", Supply: 120V/60Hz/max 250W	34" x 30" x 12", Supply: 120V/60Hz/max 250W	34" x 30" x 12", Supply: 120V/60Hz/max 250W
On platform	2x 120V/ max. 250W each	2x 120V/ max. 250W each	2x 120V/ max. 250W each	2x 120V/ max. 250W each
Transformer alarm contacts: Thermo / Pressure / Fluid level	● / ○ / ○	● / ○ / ○	● / ○ / ○	● / ○ / ○
Transformer oil containment	○	○	○	○
Delivery FCA/on site	● / ○	● / ○	● / ○	● / ○

CANOPY CONFIGURATION

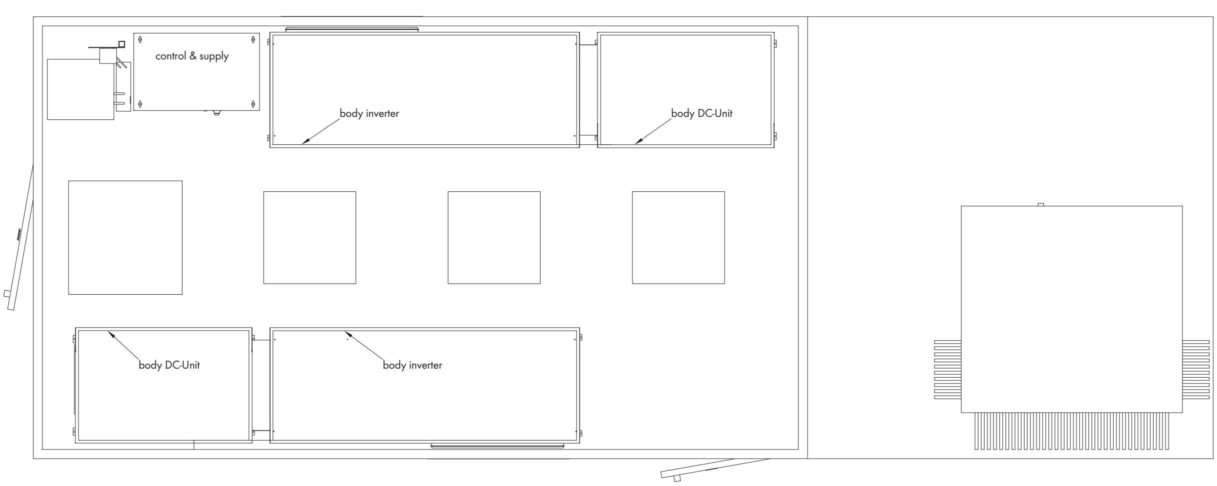


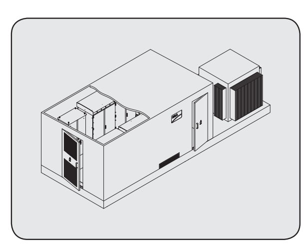


Technical data	SAMPLE CONFIGURATIONS			
	MVPP 1.0 MW		MVPP 1.5 MW	MVPP 1.6 MW
	600 V DC	1000 V DC	1000 V DC	1000 V DC
Platform design				
Open including Disconnect Units				
Width / Height / Depth	29′ / 8′9″ / 12′	29′ / 8′9″ / 12′	29′ / 8′9″ / 12′	29′ / 8′9″ / 12′
Weight (lb)	<39,000	<39,000	<39,000	<39,000
Open excluding Disconnect Units				
Width / Height / Depth	24′ / 8′9″ / 12′	24′ / 8′9″ / 12′	24′ / 8′9″ / 12′	24′ / 8′9″ / 12′
Weight (lb)	<34,000	<34,000	<34,000	<34,000
Canopy including Disconnect Units				
Width / Height / Depth (roof)	31′ / 10′6″ / 14′	31′ / 10′6″ / 14′	31′ / 10′6″ / 14′	31′ / 10′6″ / 14′
Weight (lb)	<42,000	<42,000	<42,000	<42,000
Canopy excluding Disconnect Units				
Width / Height / Depth (roof)	26′ / 10′6″ / 14′	26′ / 10′6″ / 14′	26′ / 10′6″ / 14′	26′ / 10′6″ / 14′
Weight (lb)	<37,000	<37,000	<37,000	<37,000
Enclosure including Disconnect Units				
Width / Height / Depth	32′ / 10′6″ / 12′	32′ / 10′6″ / 12′	32′ / 10′6″ / 12′	32′ / 10′6″ / 12′
Weight (lb)	<48,000	<48,000	<48,000	<48,000
Enclosure excluding Disconnect Units				
Width / Height / Depth	27′ / 10′6″ / 12′	27′ / 10′6″ / 12′	27′ / 10′6″ / 12′	27′ / 10′6″ / 12′
Weight (lb)	<43,000	<43,000	<43,000	<43,000
● Standard features ○ Optional features – Not available				
Type designation	MV-1000HE-US	MV-1000CP-10	MV-1500CP-10	MV-1600CP-10

a) @ 1.05 U_{ACnom} and cos $\varphi = 1$
b) Standard: 1000 V DC, optional 1100 V DC with a start-up < 1000 V DC
c) Reduction from 1600 kVA to 1400 kVA in 40 kVA steps possible to balance module degradation
d) Pier height 3 ft max., mounting via wedge anchors included in delivery
e) Suitable to -13 °F ... +140 °F, has to include buffer module

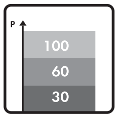
ENCLOSED CONFIGURATION





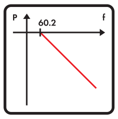
SMART GRID MANAGEMENT INCLUDED

SMA inverters in the MV Power Platform can fulfill the following grid management specifications with:



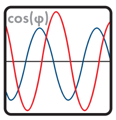
Power limitation peak shaving / grid safety management

In order to avoid short-term grid overload, the grid operator presets a nominal active power value which the inverter will implement within 60 seconds. The nominal value is transmitted to the inverters via a ripple control receiver in combination with the SMA Power Reducer Box. Typical limit values are 100, 60, 30, or 0 percent of the nominal power.



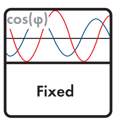
Frequency-dependent control of active power

Starting at a defined grid frequency, the inverter will automatically reduce the fed-in active power along a preset characteristic curve, which stabilizes grid frequency.



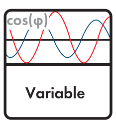
Grid support through reactive power

In order to keep the grid voltage constant, SMA inverters supply leading or lagging reactive power to the grid. For this, there are three options:



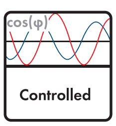
a) Fixed presetting of the reactive power by the grid operator

The grid operator presets a fixed reactive power value or a fixed phase shift between $\cos(\varphi)_{leading} = 0.9$ and $\cos(\varphi)_{lagging} = 0.9$.



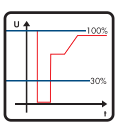
b) Dynamic presetting of the reactive power by the grid operator

The grid operator presets a dynamic phase shift - any value between $\cos(\varphi)_{leading} = 0.9$ and $\cos(\varphi)c_{lagging} = 0.9$. It is transmitted either through a communication unit or via a standardized current signal (I=4...20 mA) in accordance with IEC.



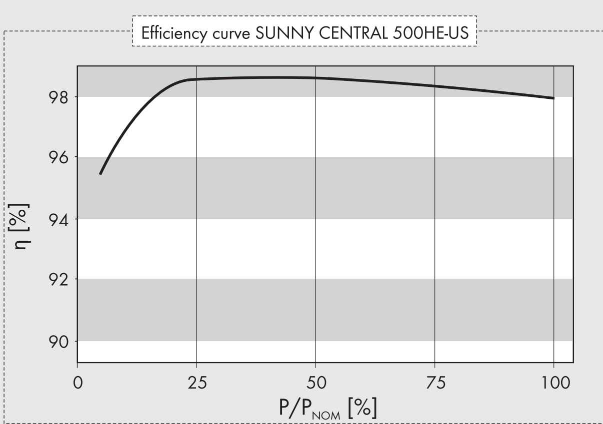
c) Control of the reactive power through a characteristic curve

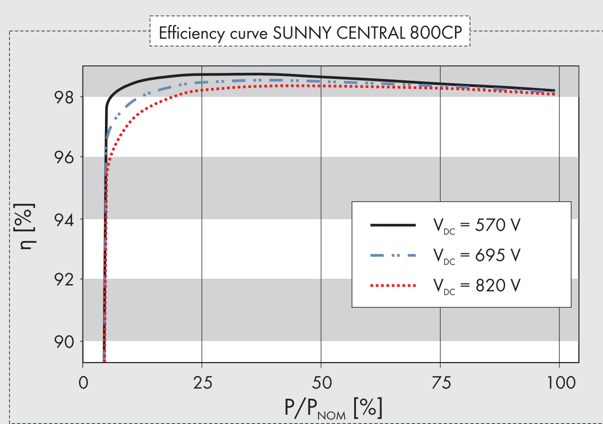
Either the reactive power or the phase shift is controlled by a pre-defined characteristic curve - depending on the fed-in active power or grid voltage.



LVRT (Low Voltage Ride-Through) 1000V ONLY

Until now, PV systems have had to disconnect from the grid immediately even during short grid voltage losses. Using the monitored dynamic grid support, SMA inverters can feed in immediately after short-term voltage losses—as long as the nominal voltage exceeds fixed values.





SERVICE FOR POWER PLANT SOLUTIONS

With a PV plant's expected service life exceeding 20 years, careful consideration must be given to not just the technologies used but also the reliability and durability of a system's components. Likewise, a comprehensive plan must be in place for the maintenance and operation of the plant. SMA Service for PV power plants addresses these needs and ensures optimum inverter availability—providing integrators, investors and utilities with the greatest security possible.

SMA also understands that every PV power plant is different and requirements vary. That's why we developed a modular service approach specifically designed for large power plants. This allows our customers to define individual service packages that best meet their needs. Approaching 100 service locations worldwide, SMA Service guarantees outstanding local customer support through a variety of customizable packages.

Maintenance
To optimize system performance, SMA performs controls, cleaning and parts replacement at regular intervals. This preventative maintenance is important for long term operation.

Spare parts warranty
Whether electronic or mechanical, we guarantee the availability of all components over the duration of the complete system life cycle. Our customers can be confident that even as technologies evolve, SMA's support will be constant. This guarantee also provides additional cost security for the operational life of the inverter solution.

Diagnostics and repair
Beginning with remote service, which often eliminates on-site assistance, to First Level, (diagnostics and small repairs), or Second Level Support, (comprehensive repairs), SMA offers the proper service plan for our customers' needs. Customers can optionally administer First Level Support themselves. With local staff to assist, SMA Service quickly provides the appropriate response to any situation.

Inverter availability
SMA inverters lead the industry. Our customers know our world-class manufacturing and high-quality components result in a superior solution. To fully protect investment security, SMA offers two inverter uptime guarantees: 98 or 99 percent. With these guarantees, we will reimburse the customer for the difference between the actual and agreed-upon inverter uptime. With warranty periods up to 25 years in length, SMA can also guarantee our solution's performance for the life of the PV plant.

Need more information?
Call SMA Power Plant Solutions at +1 888 476 2872 to hear more.

Toll Free +1 888 4 SMA USA
www.SMA-America.com

SMA America, LLC

HGC ENGINEERING
noise · vibration · acoustics

HOWE GASTMEIER CHAPNIK LIMITED
2000 Argentia Road
Plaza 1, Suite 203
Mississauga, ON
L5N 1P7 Canada

Tel: (905) 826-4044
Fax: (905) 826-4940

November 21, 2011

Janos Rajda, P. Eng.
SMA Solar Technology Canada, Inc.

Via email: <Janos.Rajda@SMA-America.com>

Re: Sound Level Predictions for Inverter Enclosure with Two SC500HE-US Power Inverter Units

Dear Janos,

HGC Engineering was retained by SMA Solar Technology Canada ("SMA") to determine sound levels emitted by an electrical inverter enclosure (SMA type MV-PP-US-04:ZD22111) containing two SC500HE-US inverter units. The sound level predictions were conducted for a mitigated and unmitigated enclosure configuration, and were based on sound data for an SC500HE-US inverter unit and engineering drawings provided by SMA.

For the unmitigated enclosure configuration, the wall and roof assemblies were understood to be sandwich panels consisting of 18 gauge solid steel sheets separated by a 3 inch deep cavity filled with fibreglass insulation.

The mitigated configuration was assumed to include perforated steel on the inner side of the wall sandwich panel, instead of solid steel material. Additionally, each inverter air exhaust was assumed to be equipped with a rectangular and acoustically lined duct. A pair of lined ducts was assumed to be attached vertically on the outside of the enclosure wall, each connected to an inverter air exhaust located approximately 0.4 metres above grade. The air would then exhaust in the horizontal direction through a louver at the top of the duct, located at the roof level, approximately 2 metres above the original exhaust opening. The width and the height of the duct were assumed to be 1150 mm and 200 mm, respectively. The acoustical lining inside the ducts was assumed to be 25 mm thick.

Using the established engineering prediction methods, sound levels were predicted of the inverter exhaust fans, the louvered air intake in the door, as well as sound emanating through the walls and roof assemblies. Total sound power levels of these sources are expressed for both the mitigated and unmitigated configurations in the table below as linear weighted octave band spectrums and A-weighted overall sound power levels.

Table 1: Estimated Sound Power Level – Enclosure With Two SC500HE-US Inverter Units (dB)

Octave Band Centre Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	Overall A-weighted
Unmitigated	107	95	93	87	78	70	61	68	89
Mitigated	102	87	80	69	60	52	43	50	79

Please note that the sound data provided by the manufacturer appears to be approximate, in that the measurements were not conducted in full accordance with any of the widely accepted test standards (e.g. ISO 3744) and there were a number of minor inconsistencies in the quoted levels. Since the calculations of the enclosure sound power level are based on the data from the inverter manufacturer, any uncertainties in that data will affect the calculated outdoor sound levels commensurately.

Trusting this is satisfactory, do not hesitate to contact the undersigned, if you have any questions.

Yours truly,
Howe Gastmeier Chapnik Limited

Petr Chocensky, PhD, (Civ.Eng.)