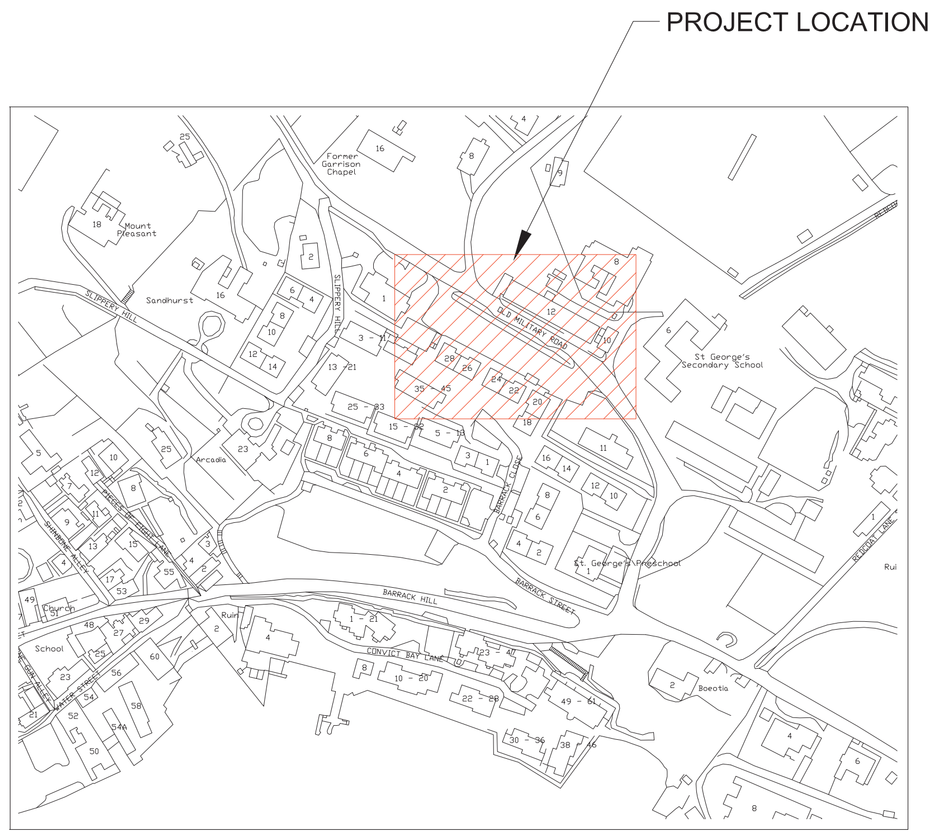
DPT BUS DEPOT REFURBISHMENT PROJECT

ST. GEORGE'S, BERMUDA



LOCATION PLAN
SCALE: NOT TO SCALE

NORTH

SHEET INDEX (CIVIL & STRUCTURAL)

SHEET	DESCRIPTION
C0.0	TITLE SHEET
C1.0	SURVEY PLAN
C1.1	REMOVALS PLAN
C2.0	SITE PLAN
C3.0	UTILITY PLAN
D1.0 – D1.3	CIVIL DETAILS
S.0	STRUCTURAL NOTES AND SCHEDULES
S1.1	ELECTRICAL ROOM PLAN AND SECTIONS
S1.2	GUARD HOUSE & STORAGE PLANS AND SECTIONS
S2.1	ELECTRICAL ROOM ELEVATIONS
S2.2	GUARD HOUSE & STORAGE ELEVATIONS
S3.1	WINDOW AND DOOR SCHEDULE
SP1.0 – SP1.4	PROJECT SPECIFICATIONS

SHEET INDEX (ELECTRICAL)

SHEET	DESCRIPTION
E100	LEGEND, GENERAL NOTES
E401	480V MAIN DISTRIBUTION SCHEMATIC
E402	480V DISTRIBUTION PANEL 1 SCHEMATIC
E403	480V DISTRIBUTION PANEL 2 SCHEMATIC
E404	ELECTRICAL PANEL SCHEDULE DETAILS
E501	ELECTRICAL ROOM LAYOUT
E601	COMMUNICATIONS SCHEMATIC DIAGRAM

DATE	NO:	REVISION
SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
TITLE SHEET

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	**C0.0**
DATE:	JANUARY 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (½"=1'-0" ON 24x36 SHEET = ¼"=1'-0" ON 11x17 SHEET)

LEGEND

conc	concrete
LP	light pole
EP/LP	electric/light pole
IC	inspection cover
RS	road sign
	underground electric
	underground utility
	overhead wires
	vegetation
	chainlink fence
+	spot level

NOTE: ELEVATIONS SHOWN ARE IN METERS (m)

LOCATION OF UTILITIES FOR ILLUSTRATIVE PURPOSES ONLY. EXACT LOCATION OF UTILITIES TO BE FIELD DETERMINED UPON EXISTING UTILITY LOCATE.

CONTRACTOR TO COORDINATE ALL UTILITY WORKS AND RESPECTIVE SEQUENCING WITH EACH UTILITY COMPANY

TOPOGRAPHIC SURVEY PROVIDED BY GOVERNMENT OF BERMUDA - DEPARTMENT OF PUBLIC LANDS AND BUILDINGS. NOTE: ALL ELEVATIONS IN FEET

1 C1.0 SURVEY PLAN (OVERALL)
SCALE: 1/16" = 1'-0"

NORTH

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ST. GEORGE'S, BERMUDA

TITLE:
SURVEY PLAN

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	C1.0
DATE:	JANUARY 2021		

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DEMOLITION NOTES:

1. ALL EXISTING CONSTRUCTION DAMAGED BY WORK UNDER THIS CONTRACT SHALL BE RESTORED TO MATCH ORIGINAL CONDITION, NEW WORK SUCH AS, BUT NOT LIMITED TO, PATCHING, PAINTING, ETC., SHALL MATCH EXISTING.

3. CONTRACTOR SHALL INVESTIGATE FIELD CONDITIONS AND PROVIDE, AS REQUIRED, TEMPORARY SUPPORTS, SHORING AND/OR PROTECTION FOR EXISTING STRUCTURES INVOLVED WITH CONSTRUCTION ACTIVITIES.

4. CONTRACTOR IS TO EXERCISE EXTREME CAUTION WHEN WORKING AROUND THE EXISTING BUILDING STRUCTURES, OVERHEAD AND UNDERGROUND UTILITIES AND FOUNDATIONS. NO EXIST. FOUNDATION IS TO BE UNDERMINED.

5. REMOVE: DETACH ITEMS FROM EXISTING CONSTRUCTION AND LEGALLY DISPOSE OF THEM OFF-SITE, UNLESS INDICATED TO BE REMOVED AND SALVAGED OR REMOVED AND REINSTALLED.

6. EXISTING TO REMAIN: DEFINES EXISTING ITEMS OF CONSTRUCTION THAT ARE NOT TO BE REMOVED AND THAT ARE NOT OTHERWISE INDICATED TO BE REMOVED, REMOVED AND SALVAGED, OR REMOVED AND REINSTALLED. PROTECT CONSTRUCTION INDICATED TO REMAIN AGAINST DAMAGE AND SOILING DURING SELECTIVE DEMOLITION. WHEN PERMITTED BY ARCHITECT, ITEMS MAY BE REMOVED TO A SUITABLE, PROTECTED STORAGE LOCATION DURING SELECTIVE DEMOLITION AND CLEANED AND REINSTALLED IN THEIR ORIGINAL LOCATIONS AFTER SELECTIVE DEMOLITION OPERATIONS ARE COMPLETE.

7. THIS WORK IS TO BE CARRIED OUT BY AN EXPERIENCED FIRM THAT HAS SPECIALIZED IN DEMOLITION WORK SIMILAR IN MATERIAL AND EXTENT TO THAT INDICATED FOR THIS PROJECT.

8. THE CONTRACTOR IS TO COMPLY WITH GOVERNING REGULATIONS BEFORE BEGINNING SELECTIVE DEMOLITION. COMPLY WITH HAULING AND DISPOSAL REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

9. CONDITIONS EXISTING AT TIME OF INSPECTION FOR BIDDING PURPOSE WILL BE MAINTAINED BY OWNER AS FAR AS PRACTICAL.

10. THE CONTRACTOR IS TO NOTIFY ARCHITECT OF DISCREPANCIES BETWEEN EXISTING CONDITIONS AND DRAWINGS BEFORE PROCEEDING WITH SELECTIVE DEMOLITION.

11. HAZARDOUS MATERIALS: IT IS NOT EXPECTED THAT HAZARDOUS MATERIALS WILL BE ENCOUNTERED IN THE WORK. IF MATERIALS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS ARE ENCOUNTERED, DO NOT DISTURB; IMMEDIATELY NOTIFY ARCHITECT AND OWNER. OWNER WILL REMOVE HAZARDOUS MATERIALS UNDER A SEPARATE CONTRACT.

12. STORAGE OR SALE OF REMOVED ITEMS OR MATERIALS ON-SITE IS NOT PERMITTED.

13. MAINTAIN FIRE-PROTECTION FACILITIES IN SERVICE DURING SELECTIVE DEMOLITION OPERATIONS.

16. CONTRACTOR IS TO SURVEY EXISTING CONDITIONS AND CORRELATE WITH REQUIREMENTS INDICATED TO DETERMINE EXTENT OF SELECTIVE DEMOLITION REQUIRED.

17. WHEN UNANTICIPATED MECHANICAL, ELECTRICAL, OR STRUCTURAL ELEMENTS THAT CONFLICT WITH INTENDED FUNCTION OR DESIGN ARE ENCOUNTERED, THE CONTRACTOR IS INVESTIGATE AND MEASURE THE NATURE AND EXTENT OF CONFLICT. PROMPTLY SUBMIT A WRITTEN REPORT TO ARCHITECT.

18. THE CONTRACTOR IS TO ENGAGE A REGISTERED ENGINEER TO SURVEY CONDITION OF STRUCTURE TO DETERMINE WHETHER REMOVING ANY ELEMENT MIGHT RESULT IN STRUCTURAL DEFICIENCY OR UNPLANNED COLLAPSE OF ANY PORTION OF STRUCTURE OR ADJACENT STRUCTURES DURING SELECTIVE DEMOLITION OPERATIONS.

19. EXISTING SERVICES/SYSTEMS: CONTRACTOR IS TO MAINTAIN SERVICES/SYSTEMS INDICATED TO REMAIN AND PROTECT THEM AGAINST DAMAGE DURING SELECTIVE DEMOLITION OPERATIONS. LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP OFF INDICATED UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS SERVING AREAS TO BE SELECTIVELY DEMOLISHED.

20. CONTRACTOR IS TO ARRANGE TO SHUT OFF INDICATED UTILITIES WITH UTILITY COMPANIES. IF SERVICES/SYSTEMS ARE REQUIRED TO BE REMOVED, RELOCATED, OR ABANDONED, BEFORE PROCEEDING WITH SELECTIVE DEMOLITION PROVIDE TEMPORARY SERVICES/SYSTEMS THAT BYPASS AREA OF SELECTIVE DEMOLITION AND THAT MAINTAIN CONTINUITY OF SERVICES/SYSTEMS TO OTHER PARTS OF BUILDING.

21. CUT OFF PIPE OR CONDUIT IN WALLS OR PARTITIONS TO BE REMOVED. CAP, VALVE, OR PLUG AND SEAL REMAINING PORTION OF PIPE OR CONDUIT AFTER BYPASSING.

22. SITE ACCESS AND TEMPORARY CONTROLS: CONDUCT SELECTIVE DEMOLITION AND DEBRIS-REMOVAL OPERATIONS TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, WALKS, WALKWAYS, AND OTHER ADJACENT OCCUPIED AND USED FACILITIES.

24. CONTRACTOR IS TO PROVIDE TEMPORARY BARRICADES AND OTHER PROTECTION REQUIRED TO PREVENT INJURY TO PEOPLE AND DAMAGE TO ADJACENT BUILDINGS AND FACILITIES TO REMAIN.

25. CONTRACTOR IS TO PROVIDE AND MAINTAIN SHORING, BRACING, AND STRUCTURAL SUPPORTS AS REQUIRED TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF CONSTRUCTION AND FINISHES TO REMAIN, AND TO PREVENT UNEXPECTED OR UNCONTROLLED MOVEMENT OR COLLAPSE OF CONSTRUCTION BEING DEMOLISHED.

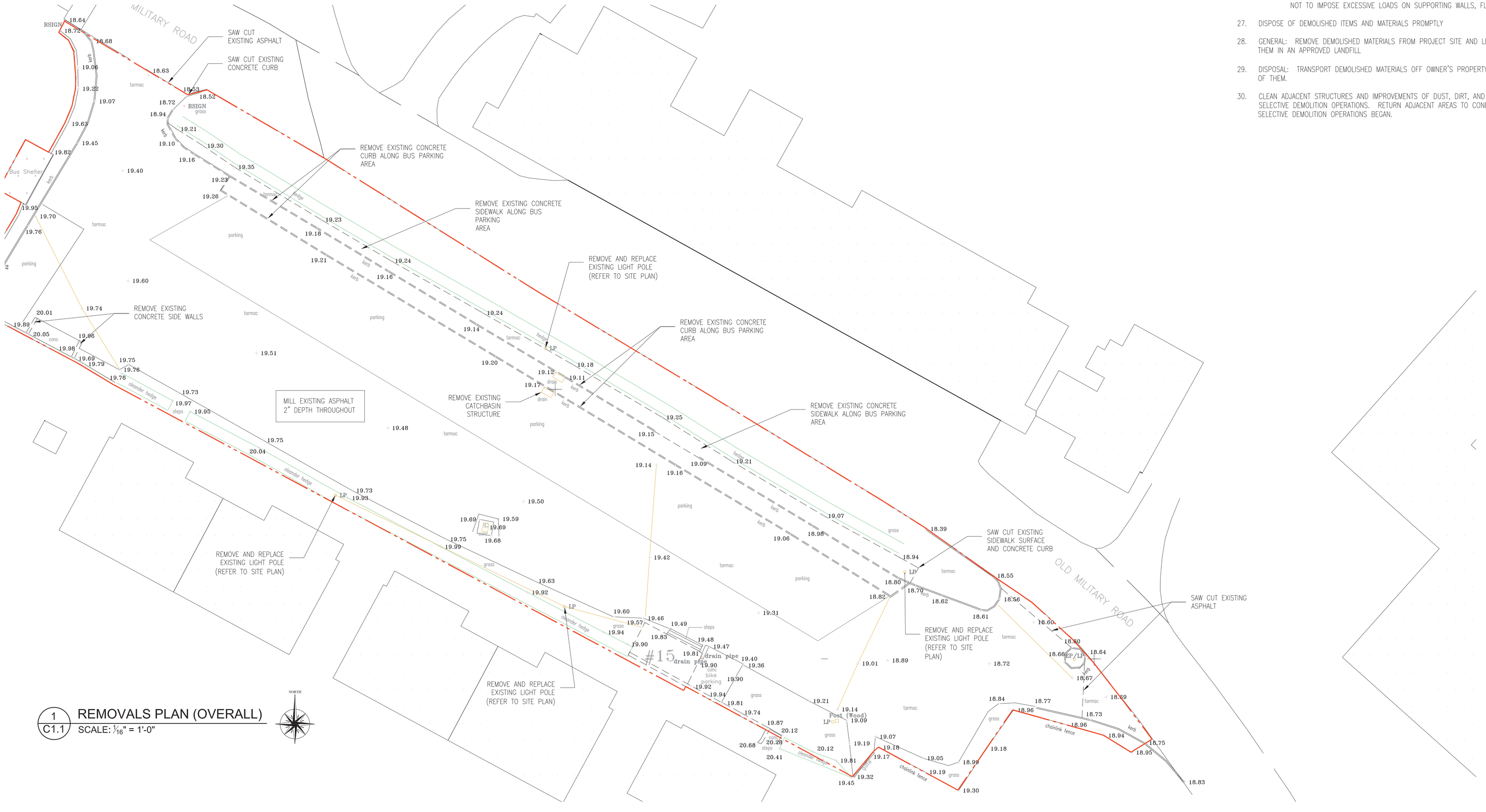
26. CONTRACTOR IS TO DEMOLISH AND REMOVE EXISTING CONSTRUCTION ONLY TO THE EXTENT REQUIRED BY NEW CONSTRUCTION AND AS INDICATED. USE METHODS REQUIRED TO COMPLETE THE WORK WITHIN LIMITATIONS OF GOVERNING REGULATIONS AND AS FOLLOWS:
   A. NEATLY CUT OPENINGS AND HOLES PLUMB, SQUARE, AND TRUE TO DIMENSIONS REQUIRED. USE CUTTING METHODS LEAST LIKELY TO DAMAGE CONSTRUCTION TO REMAIN OR ADJOINING CONSTRUCTION. USE HAND TOOLS OR SMALL POWER TOOLS DESIGNED FOR SAWING OR GRINDING, NOT HAMMERING AND CHOPPING, TO MINIMIZE DISTURBANCE OF ADJACENT SURFACES. TEMPORARILY COVER OPENINGS TO REMAIN.
   B. CUT OR DRILL FROM THE EXPOSED OR FINISHED SIDE INTO CONCEALED SURFACES TO AVOID MARRING EXISTING FINISHED SURFACES.
   C. LOCATE SELECTIVE DEMOLITION EQUIPMENT AND REMOVE DEBRIS AND MATERIALS SO AS NOT TO IMPOSE EXCESSIVE LOADS ON SUPPORTING WALLS, FLOORS, OR FRAMING.

27. DISPOSE OF DEMOLISHED ITEMS AND MATERIALS PROMPTLY

28. GENERAL: REMOVE DEMOLISHED MATERIALS FROM PROJECT SITE AND LEGALLY DISPOSE OF THEM IN AN APPROVED LANDFILL

29. DISPOSAL: TRANSPORT DEMOLISHED MATERIALS OFF OWNER'S PROPERTY AND LEGALLY DISPOSE OF THEM.

30. CLEAN ADJACENT STRUCTURES AND IMPROVEMENTS OF DUST, DIRT, AND DEBRIS CAUSED BY SELECTIVE DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO CONDITION EXISTING BEFORE SELECTIVE DEMOLITION OPERATIONS BEGAN.



1 / C1.1 REMOVALS PLAN (OVERALL)
SCALE: 1/16" = 1'-0"

SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT
DATE	NO:	REVISION

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
REMOVALS PLAN

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	C1.1
DATE:	JANUARY 2021		

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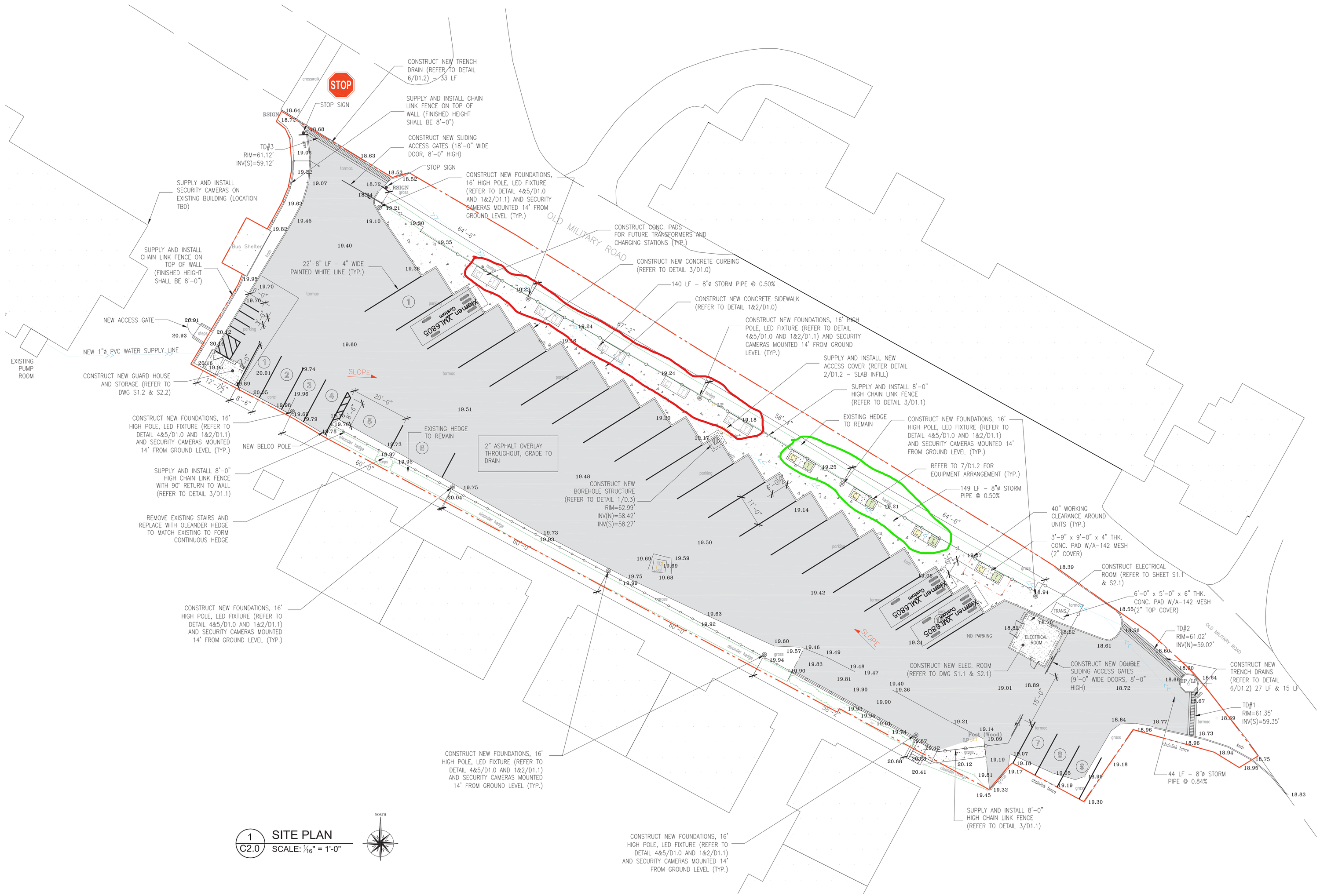

1 C2.0 SITE PLAN
SCALE: 1/16" = 1'-0"

NORTH

GENERAL NOTES

1. DO NOT SCALE THESE DRAWINGS.
2. THE CONTRACTOR SHALL CHECK ALL DIMENSIONS, GRADES & LEVELS ON SITE, PRIOR TO SETTING OUT THE WORK.
3. ALL WORK SHALL CONFORM TO THE CURRENT NATIONAL BUILDING, ELECTRICAL, FIRE AND HEALTH CODES.
4. ALL WORK SHALL BE TO THE THE DESIGNER'S APPROVAL AND SHALL CONFORM TO THESE DRAWINGS.
5. THE CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, BEST QUALITY MATERIALS, AND SKILLED MECHANICS AS REQUIRED FOR THE SATISFACTORY COMPLETION OF THE WORK AS INDICATED, OR REASONABLY INFERABLE FROM THESE DRAWINGS.
6. THE CONTRACTOR SHALL PROVIDE ALL REQUIRED COORDINATION BETWEEN THE VARIOUS TRADES, AND PORTION OF THE WORK.
7. THE CONTRACTOR SHALL CONFINE HIS OPERATIONS TO THE WORKSITE.
8. THE SITE SHALL BE KEPT FREE OF ACCUMULATED WASTE MATERIALS AND DEBRIS.
9. THE CONTRACTOR SHALL BE LIABLE FOR, AND TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION OF LIFE AND PROPERTY DURING THE COURSE OF THE WORK.
10. ALL MATERIAL AND DEBRIS SHALL BE REMOVED AT THE COMPLETION OF THE JOB AND THE WORK LEFT BROOM CLEAN.
11. THE CONTRACTOR, WITHOUT COST TO THE OWNER, SHALL PROMPTLY CORRECT ANY WORK FOUND TO BE DEFECTIVE WITHIN ONE YEAR OF COMPLETION OF THE WORK.

REGISTERED PROFESSIONAL CIVIL ENGINEER
No. 425
JAMIE R. RIENHOMEN
10/19/2021
BERMUDA

DATE	NO:	REVISION
SEPT 2021	2	ISSUED TO BUILDING CONTROL
FEB 2021	1	ISSUED TO CLIENT
JAN 2021	-	ISSUED TO CLIENT

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
SITE PLAN

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	C2.0
DATE:	JANUARY 2021		

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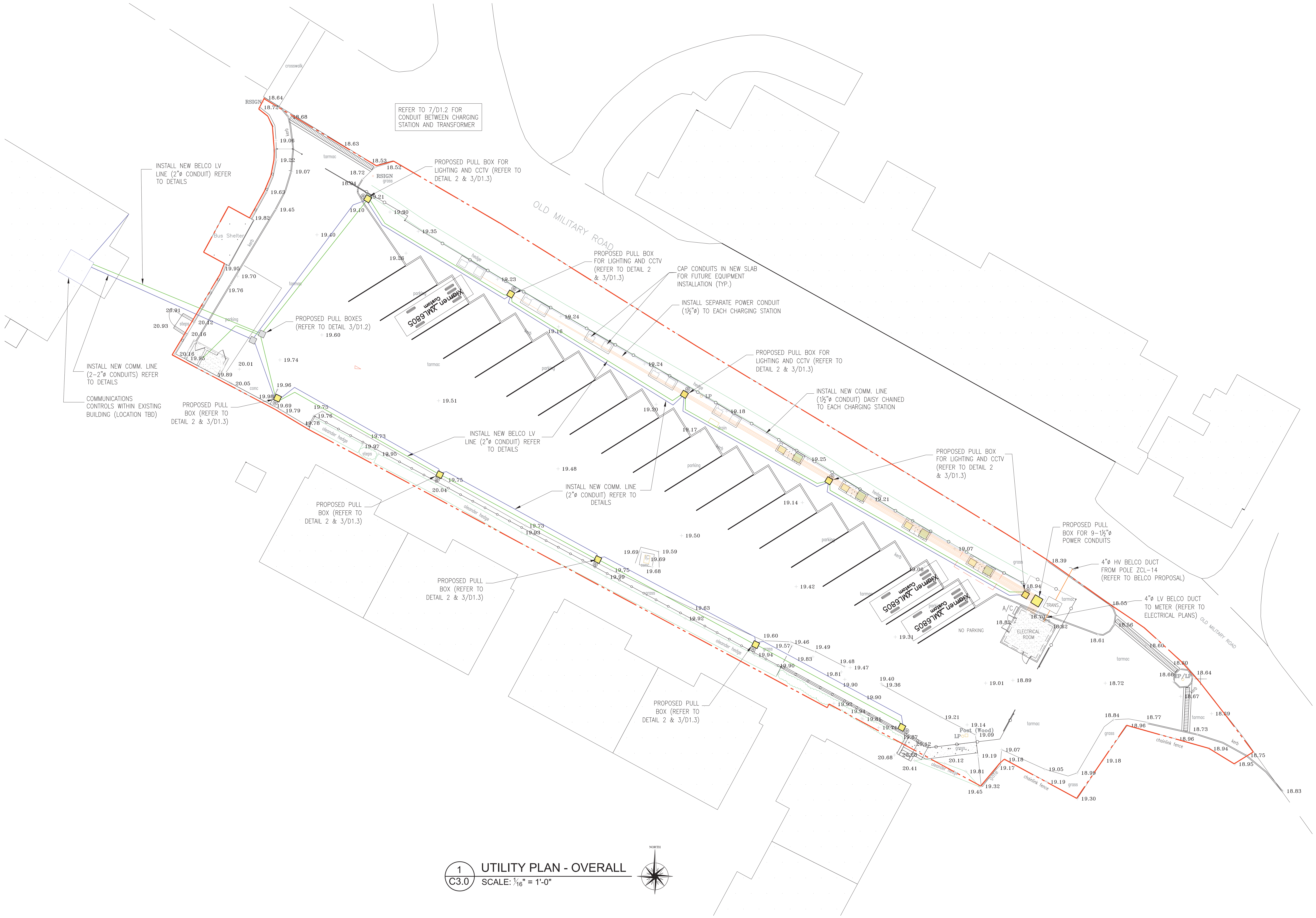

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REGISTERED PROFESSIONAL CIVIL ENGINEER No. 128 JAMES R. PERKONEN 10/19/2021 BERMUDA

LOCATION OF UTILITIES FOR ILLUSTRATIVE PURPOSES ONLY. EXACT LOCATION OF UTILITIES TO BE FIELD DETERMINED UPON EXISTING UTILITY LOCATE.

CONTRACTOR TO COORDINATE ALL UTILITY WORKS AND RESPECTIVE SEQUENCING WITH EACH UTILITY COMPANY

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JAN 2021	-	ISSUED TO CLIENT

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PROJECT:
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ST. GEORGE'S, BERMUDA

TITLE:
UTILITY PLANS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	C3.0
DATE:	JANUARY 2021		

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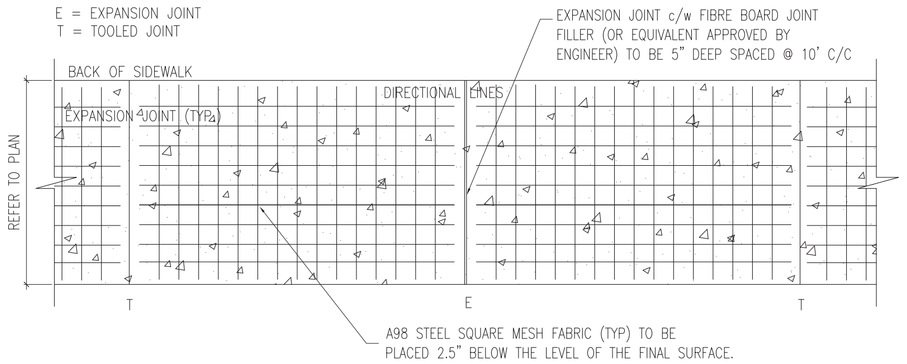
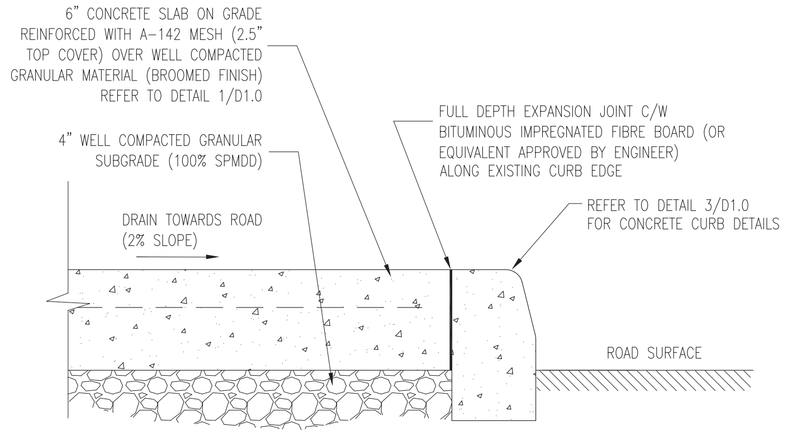
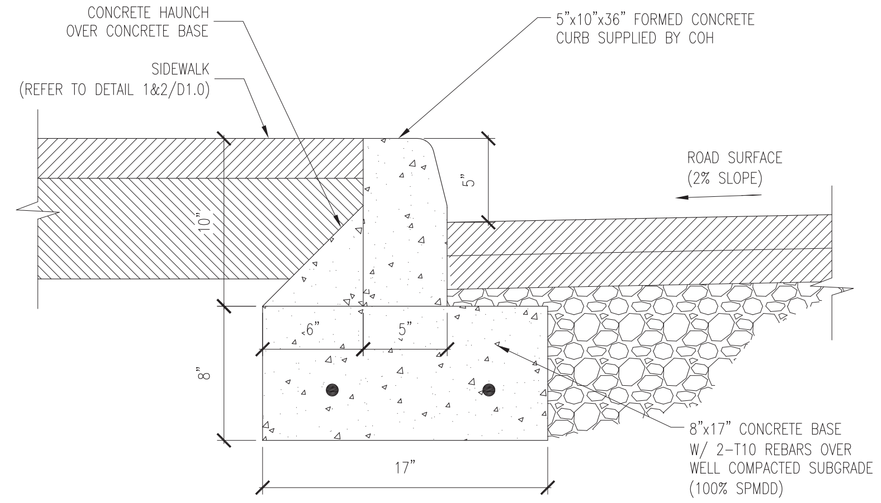


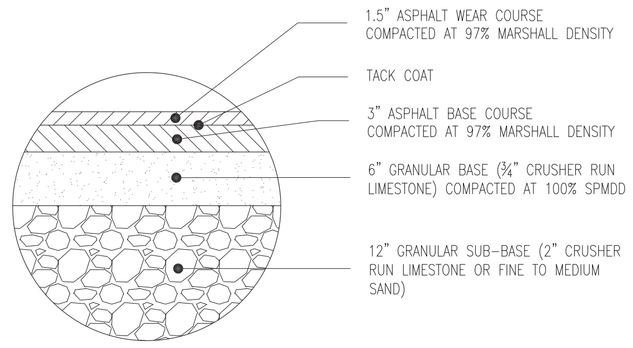
1 D1.0 TYPICAL SIDEWALK PLAN DETAIL
SCALE: NTS



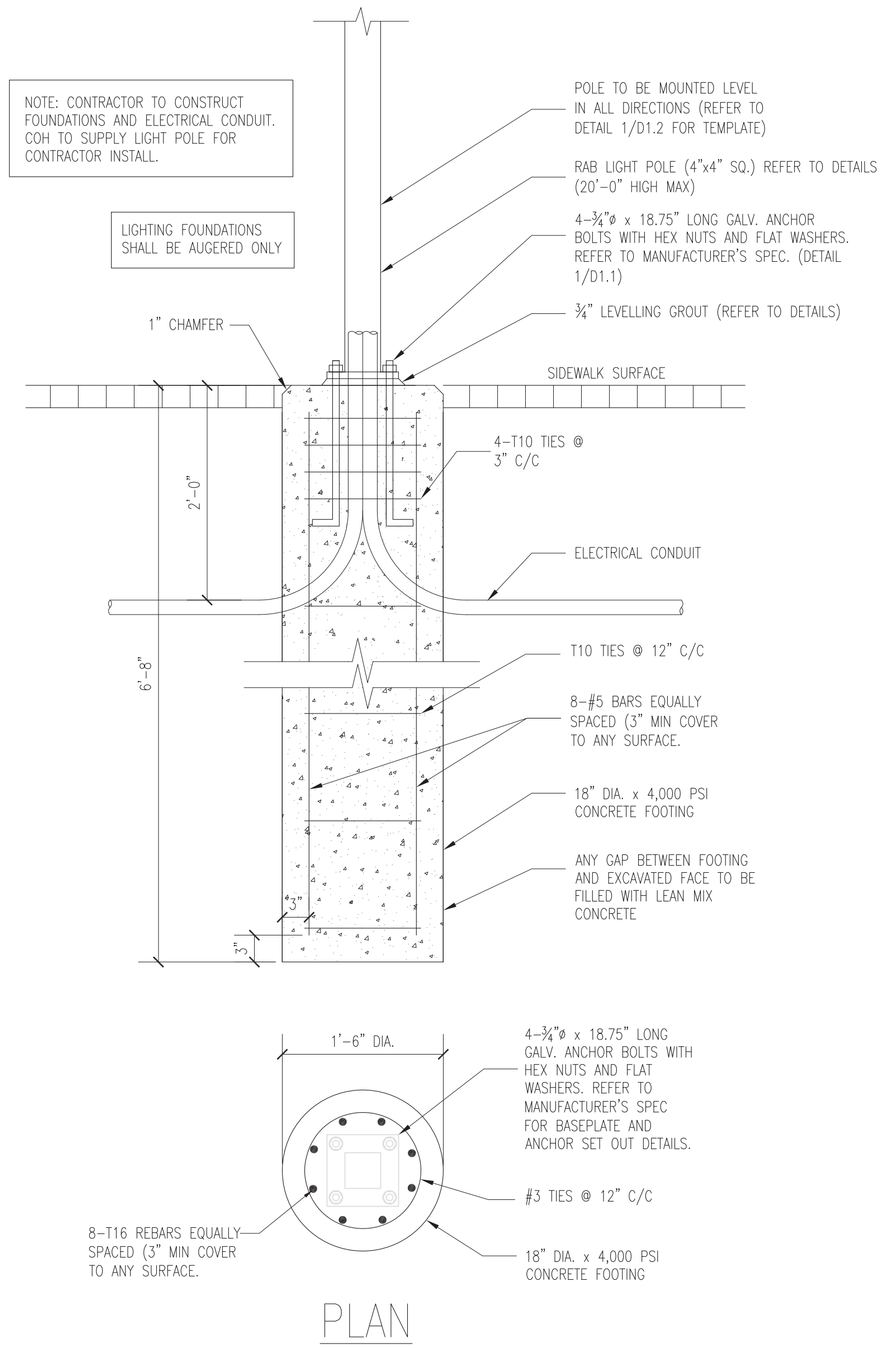
2 D1.0 TYPICAL SIDEWALK SECTION DETAIL
SCALE: NTS



3 D1.0 TYPICAL CURB AND GUTTER DETAIL
SCALE: NTS



6 D1.0 HEAVY DUTY PAVEMENT SECTION
SCALE: NTS



4 D1.0 LIGHT POLE FOUNDATION (STANDARD)
SCALE: NTS

PS4-11-20D2

RAB

Square steel poles drilled for 2 Area Lights at 180°. Designed for ground mounting. Poles are stocked nation wide for quick shipment. Protective packaging ensures poles arrive at the job site good as new.

Color: Bronze
Weight: 136.7 lbs

Project:	Type:
Prepared By:	Date:

Technical Specifications

Listings

CSA Listed:
Suitable for wet locations

Construction

Shaft:
46,000 p.s.i. minimum yield.

Hand Holes:
Reinforced with grounding lug and removable cover

Base Plates:
Slotted base plates 36,000 p.s.i.

Shipping Protection:
All poles are shipped in individual corrugated cartons to prevent finish damage

Color:
Bronze powder coating

Height:
20 FT

Weight:
137 lbs

Gauge:
11

Wall Thickness:
1/8"

Shaft Size:
4"

Hand Hole Dimensions:
3" x 5"

Bolt Circle:
8 1/2"

Base Dimension:
8"

PS4-11-20D2

RAB

Technical Specifications (continued)

Construction

Anchor Bolt:
Galvanized anchor bolts and galvanized hardware and anchor bolt template. All bolts have a 3" hook.

Anchor Bolt Templates:
WARNING Template must be printed on 11" x 17" sheet for actual size. CHECK SCALE BEFORE USING. Templates shipped with anchor bolts and available online.

Pre-Shipped Anchor Bolts:
Bolts can be pre-shipped upon request for additional freight charge

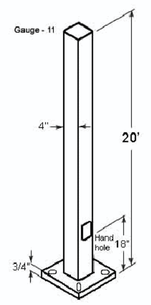
Max EPA's/Max Weights:
70MPH 10.7 ft./360 lb.
80MPH 7.0 ft./350 lb.
90MPH 4.3 ft./350 lb.
100MPH 2.5 ft./350 lb.
110MPH 1.1 ft./350 lb.
120MPH 0.1 ft./340lb

Other

Terms of Sale:
Pole Terms of Sale is available online.

Buy American Act Compliance:
RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

Dimensions



Features

- Designed for ground mounting
- Heavy duty TGIC polyester coating
- Reinforced hand holes with grounding lug and removable cover for easy wiring access
- Pole caps, base covers & bolts are sold separately
- Custom manufactured for each application

POLE HEIGHT TO BE 16'-0" HIGH (TYP.)

5 D1.0 RAB LIGHT POLE - PS4-11-20D2 (16'-0" HIGH)
SCALE: NTS

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DATE:	JANUARY 2021		

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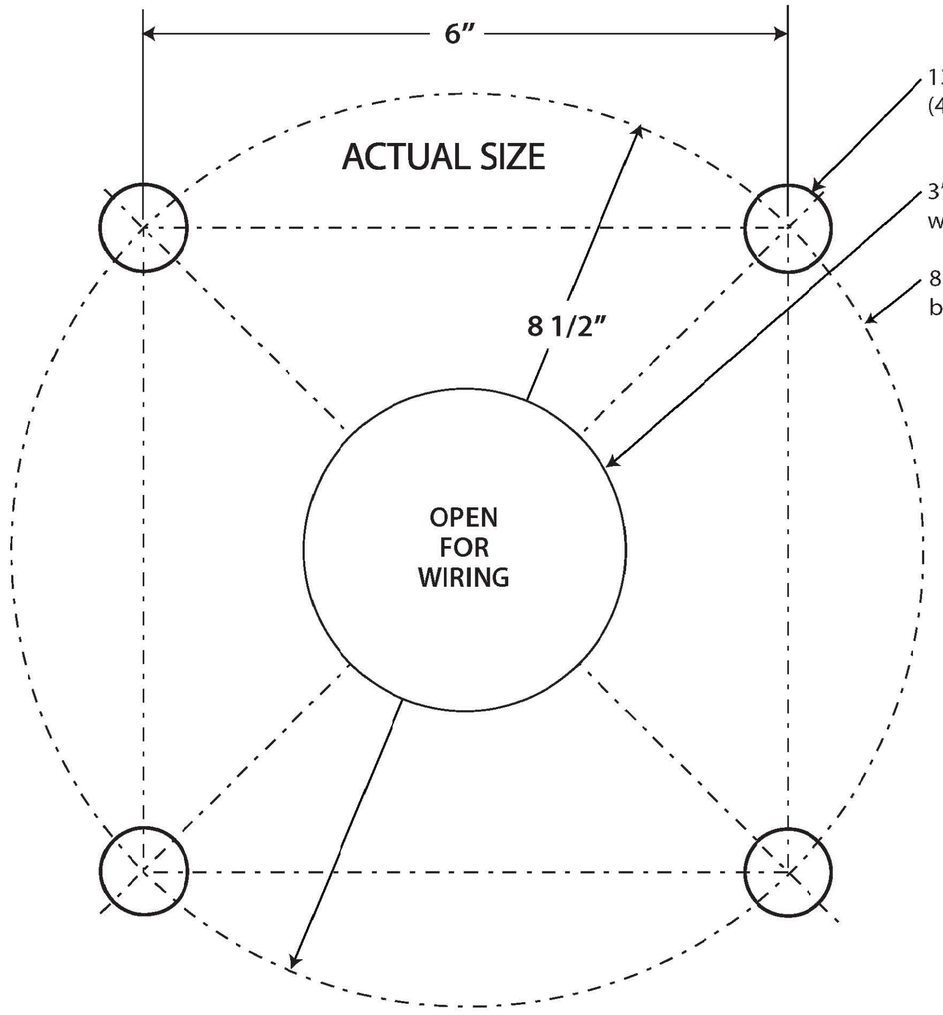
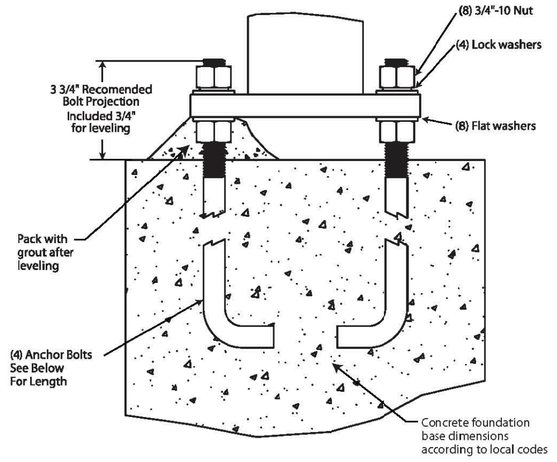
ANCHOR BOLT TEMPLATE - 4" SQUARE POLES

1615-D





- Verify bolt circle diameter and anchor bolt projection.
- Use anchor bolt template to assure accuracy.
- Drill holes in plywood and use as a locator for anchor bolts.

DRILLED TOP	
ANCHOR BOLT KIT: BOLT4/11 *with 18.75" anchor bolts fits these RAB poles*	**ANCHOR BOLT KIT: BOLT4/7** *with 30" anchor bolts fits these RAB poles*
PS4-11-10D2	PS4-07-20D2
PS4-11-15D2	PS4-07-25D2
PS4-11-20D2	PS4-07-30D2
PS4-11-25D2	

BASE COVER KIT: BCK-S4 *(for electrician)*

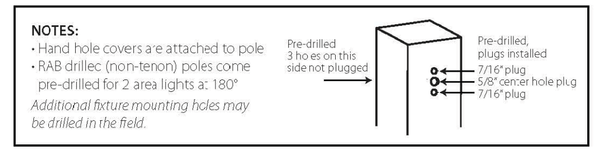
(1) 2pc steel base cover, bronze
(4) 1/4" - 20 black base cover screws
(1) 4" pole cap CAT# PCAP4 *(for use with drilled poles)*

TENON TOP	
ANCHOR BOLT KIT: BOLT4/11 *with 18.75" anchor bolts fits these RAB poles*	**ANCHOR BOLT KIT: BOLT4/7** *with 30" anchor bolts fits these RAB poles*
PS4-11-10WT	PS4-07-20WT
PS4-11-15WT	PS4-07-25WT
PS4-11-20WT	PS4-07-30WT
PS4-11-25WT	

BASE COVER: BC4 *(no cap)*

NOTES:
- Hand hole covers are attached to pole
- RAB drillec (non-tenon) poles come pre-drilled for 2 area lights a: 180°

Additional fixture mounting holes may be drilled in the field.



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Northvale, New Jersey 07647 USA
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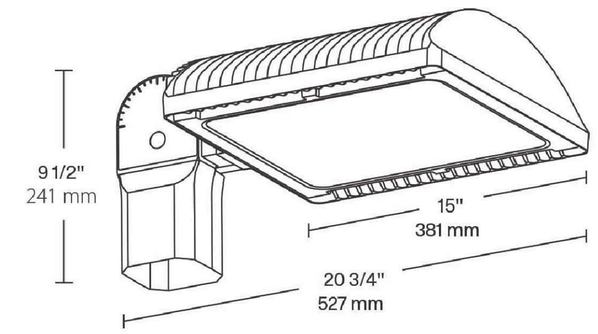
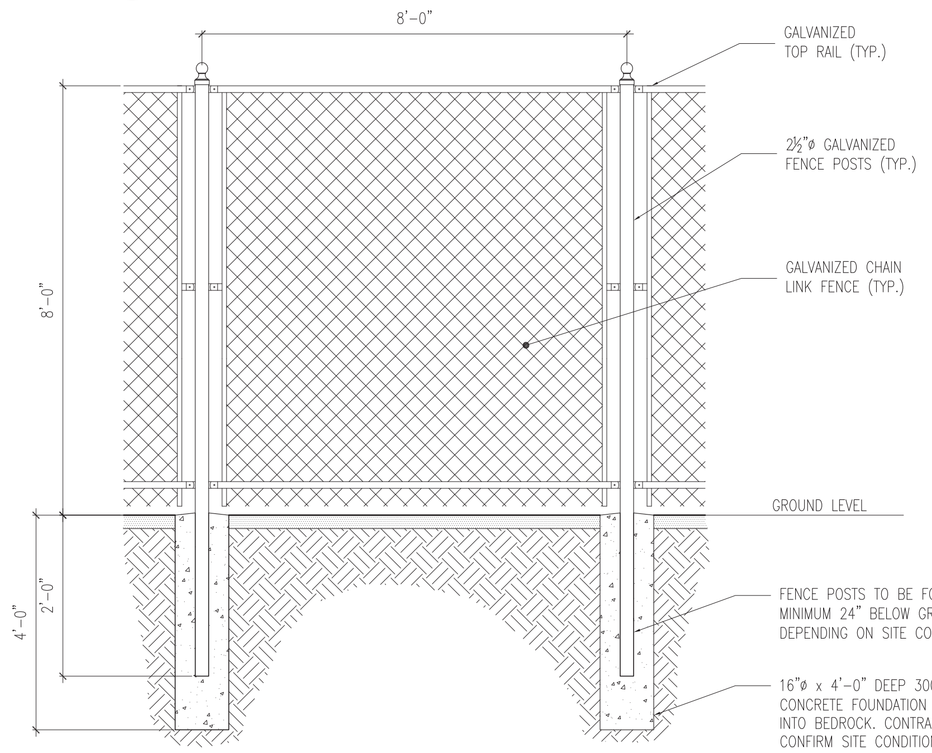


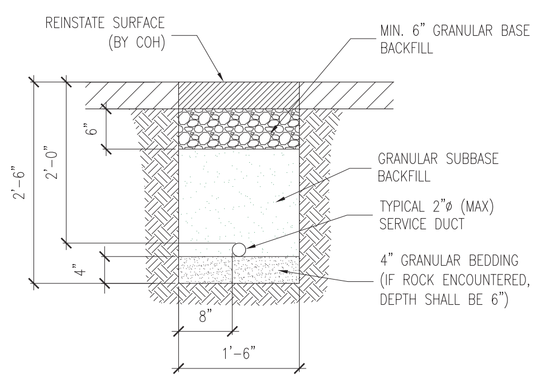
Slipfitter

2 / D1.1 RAB LIGHT STANDARD - ALED (TYPE II, 78W, 4000K)
SCALE: NTS

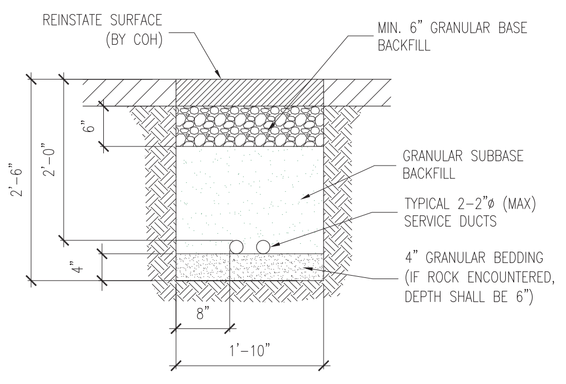


3 / D1.1 CHAIN LINK FENCING DETAIL
SCALE: ½" = 1'-0"

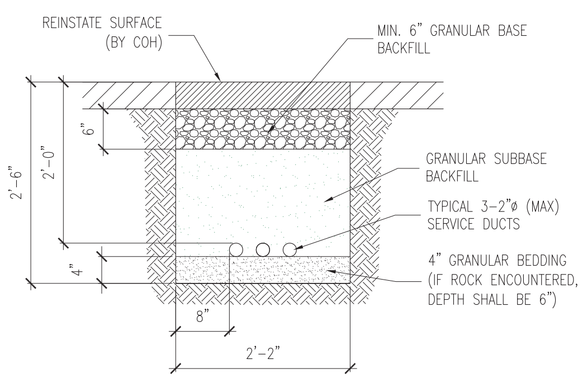
1 / D1.1 RAB LIGHTING TEMPLATE DETAIL
SCALE: NTS



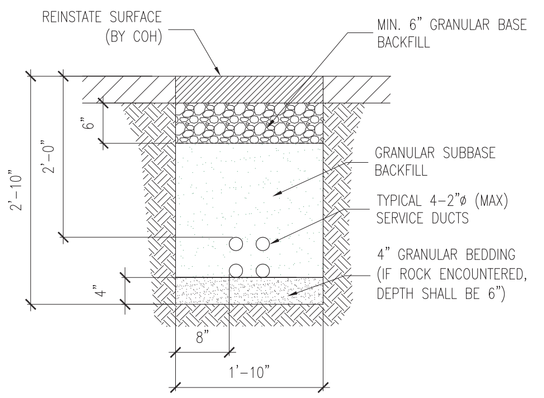
4 / D1.1 TRENCH SECTION (1 CONDUIT)
SCALE: NTS



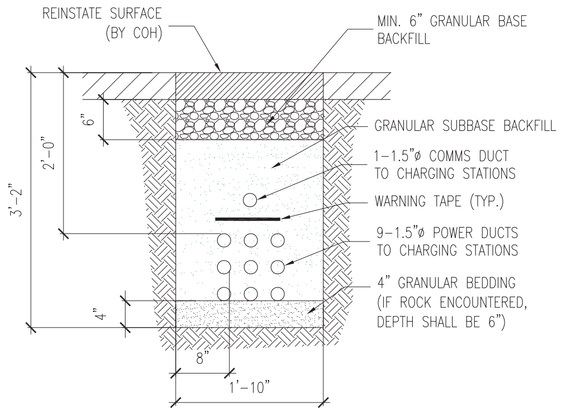
5 / D1.1 TRENCH SECTION (2 CONDUITS)
SCALE: NTS



6 / D1.1 TRENCH SECTION (3 CONDUITS)
SCALE: NTS



7 / D1.1 TRENCH SECTION (4 CONDUITS)
SCALE: NTS



8 / D1.1 TRENCH SECTION (CHARGING STATIONS)
SCALE: NTS

SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT
DATE	NO:	REVISION

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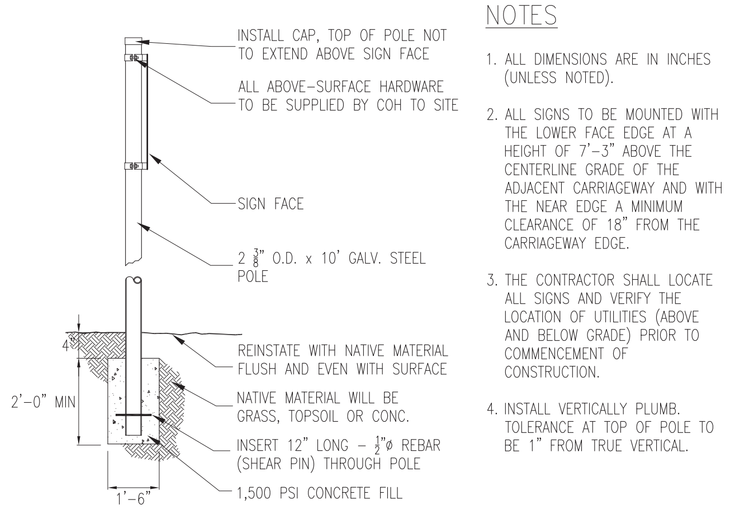
PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
CIVIL DETAILS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	D1.1
DATE:	JANUARY 2021		

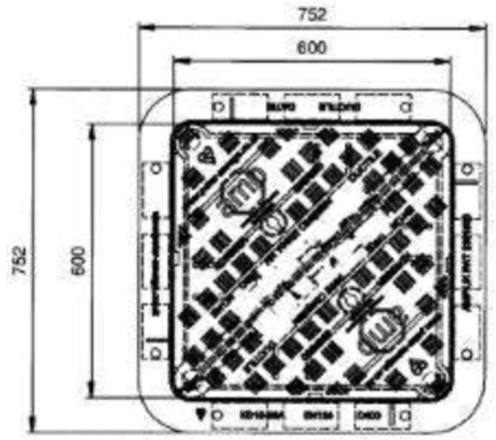
DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS, DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (½"=1'-0" ON 24x36 SHEET = ⅜"=1'-0" ON 11x17 SHEET)

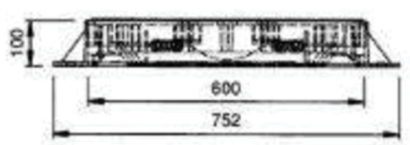


NOTES

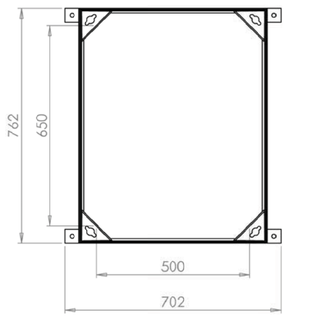
1. ALL DIMENSIONS ARE IN INCHES (UNLESS NOTED).
2. ALL SIGNS TO BE MOUNTED WITH THE LOWER FACE EDGE AT A HEIGHT OF 7'-3" ABOVE THE CENTERLINE GRADE OF THE ADJACENT CARRIAGEWAY AND WITH THE NEAR EDGE A MINIMUM CLEARANCE OF 18" FROM THE CARRIAGEWAY EDGE.
3. THE CONTRACTOR SHALL LOCATE ALL SIGNS AND VERIFY THE LOCATION OF UTILITIES (ABOVE AND BELOW GRADE) PRIOR TO COMMENCEMENT OF CONSTRUCTION.
4. INSTALL VERTICALLY PLUMB. TOLERANCE AT TOP OF POLE TO BE 1" FROM TRUE VERTICAL.

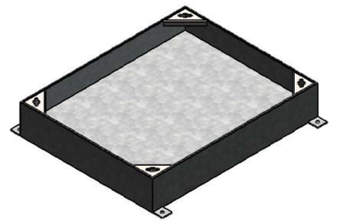
1 / D1.2 TRAFFIC SIGN INSTALLATION DETAIL
SCALE: ½" = 1'-0"

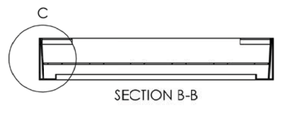


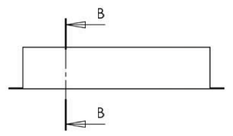


4 / D1.2 D400 DOUBLE TRIANGULAR GRATE DETAIL
SCALE: NTS





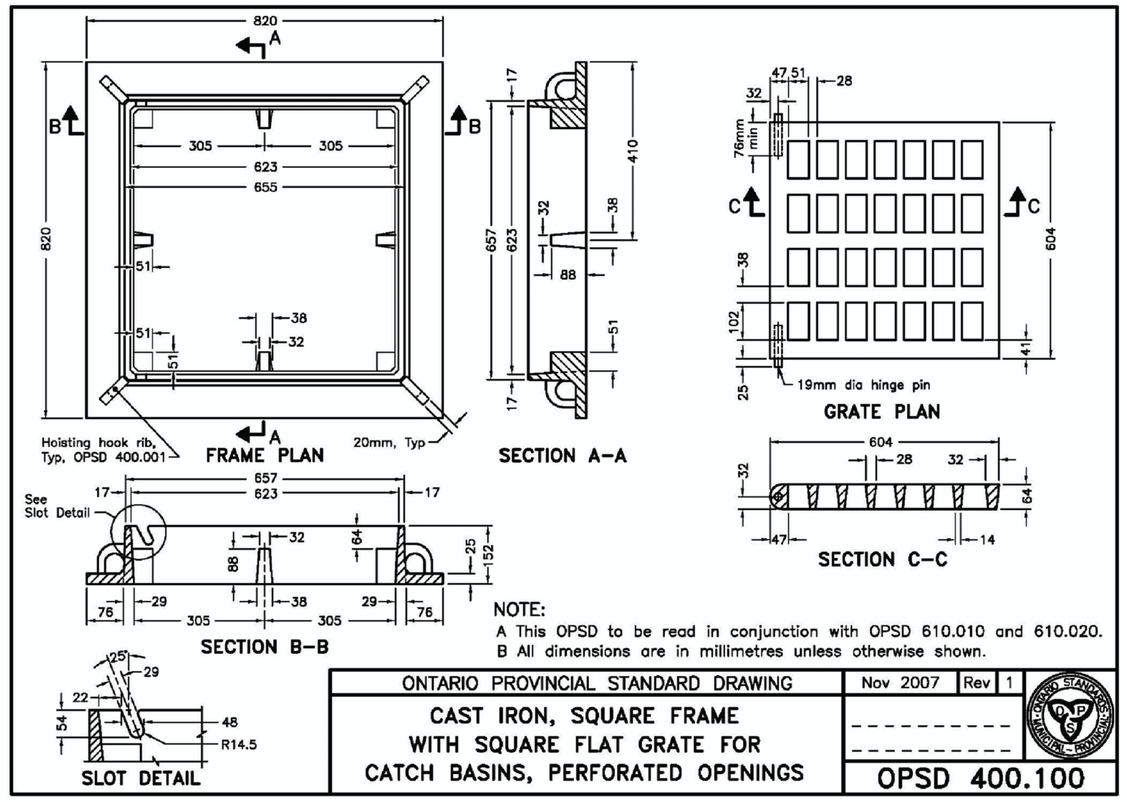




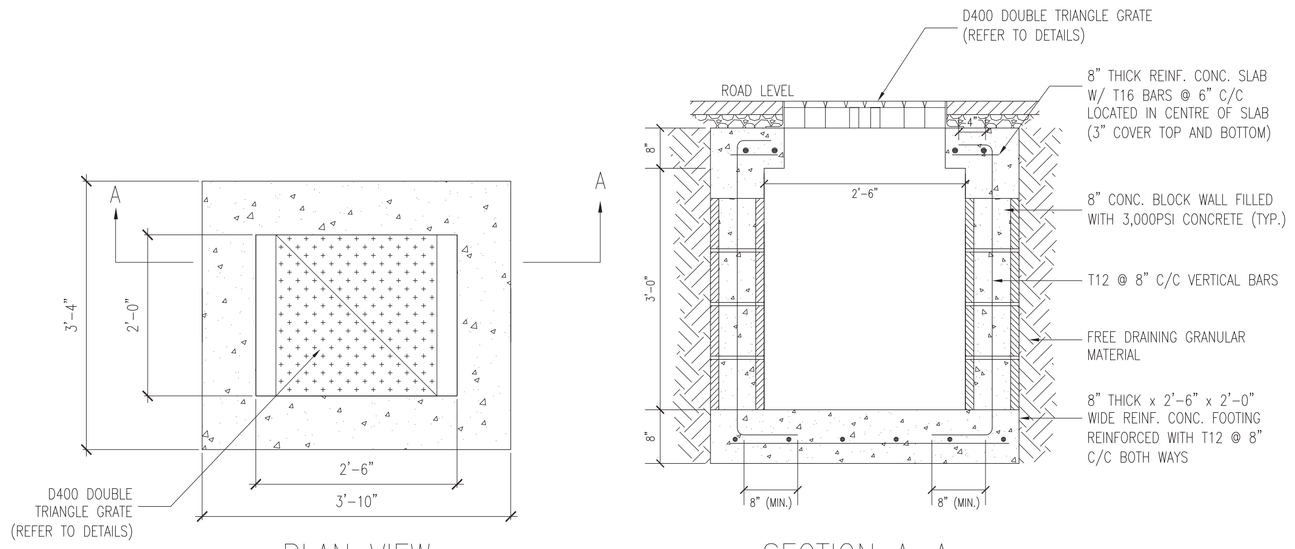
DWG. NO.	
DWG REF	

Customer:	A3	Description: 650x500 Recessed Block Paviors FACTA AAA			
		Name	Date	Material:	Mild Steel
	Drawn By:	Sandy McTie-Hyland	29/12/20`2	Finish:	Galvanised Steel
	Checked By:	Iain McTie-Hyland	29/12/20`2	Loading:	Facta AAA
	Scale:	1:10		Weight(kg):	38.55

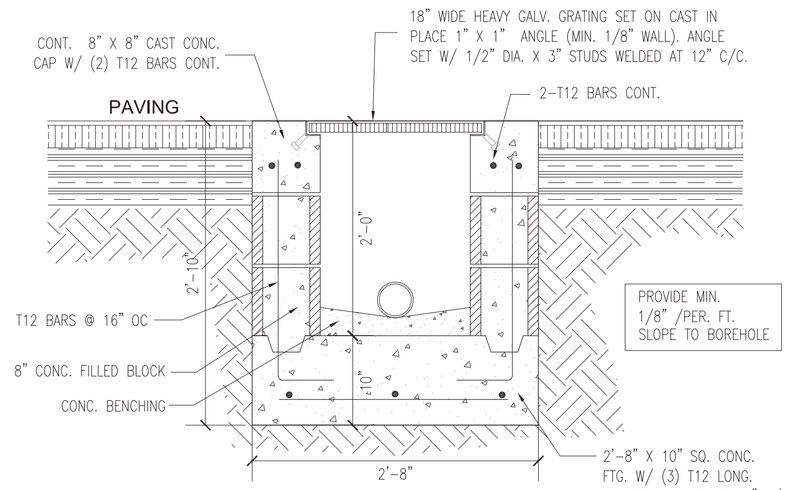
2 / D1.2 RECESSED COVER (SLAB INFILL) 20"x26"
SCALE: NTS



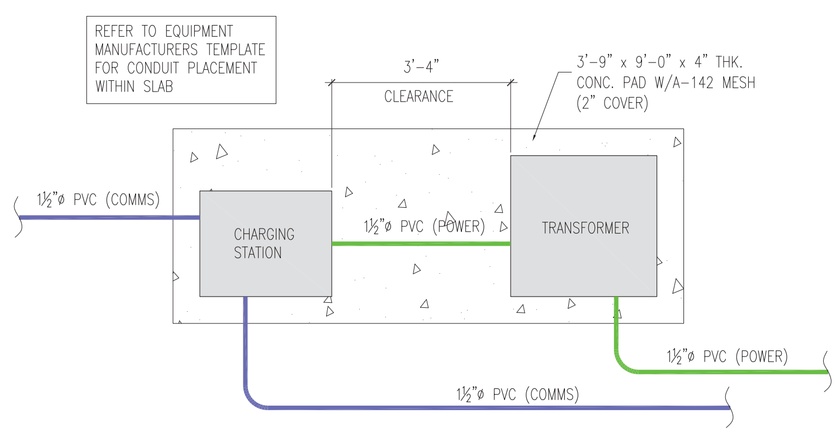
5 / D1.2 OPSD 400.100 CAST IRON GRATE
SCALE: NTS



3 / D1.2 TYPICAL PULL CHAMBER
SCALE: NTS



6 / D1.2 TYPICAL TRENCH DRAIN
SCALE: NTS



7 / D1.2 TYPICAL EQUIPMENT ARRANGEMENT
SCALE: NTS

DATE	NO:	REVISION
SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT

REGISTERED PROFESSIONAL CIVIL ENGINEER No.123 JAMES BEHOREN 10/19/2021 BERMUDA

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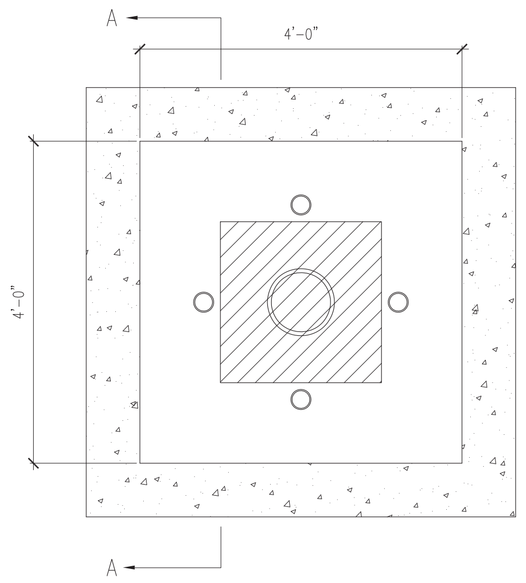
PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
CIVIL DETAILS

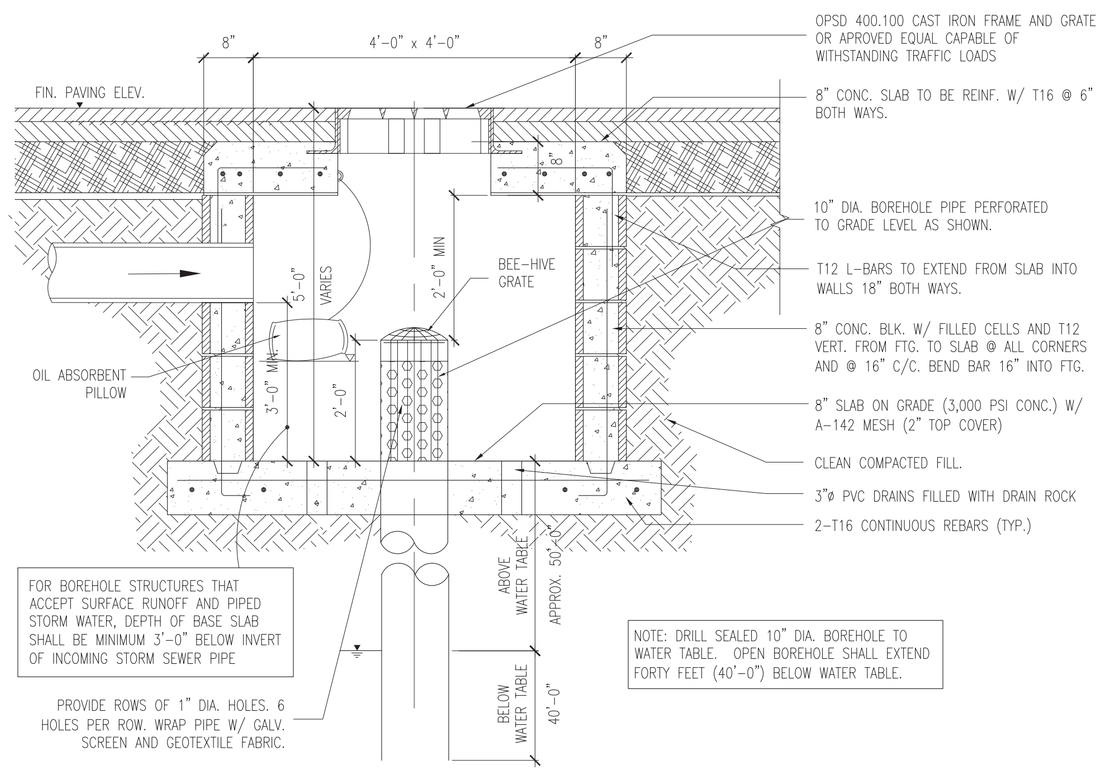
SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	D1.2
DATE:	JANUARY 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ½"=1'-0" ON 11x17 SHEET)



PLAN VIEW

FOR BOREHOLE STRUCTURES THAT ACCEPT SURFACE RUNOFF AND PIPED STORM WATER, DEPTH OF BASE SLAB SHALL BE MINIMUM 3'-0" BELOW INVERT OF INCOMING STORM SEWER PIPE



SECTION A-A

1 D1.3 TYPICAL BOREHOLE STRUCTURE
SCALE: NTS

Chamber And Duct Systems
STAKKAbox™ Modula

Applications: Traffic Signals, Street Lighting, Motorway Comms, CCTV, Power and Gas, Telecommunications, Rail Infrastructure, Cable Television, Water Service, Surface Water, Drainage, Permanent Formwork

The STAKKAbox™ Modula are a family of pre-formed twin wall access chambers which have been developed for use in both footway and carriageway installations. The STAKKAbox™ system consists of 155mm deep ring sections which are stacked on top of each other to form chambers of varying depths. Each ring is castellated to positively interlock with the unit above and below. The sections are available with duct entry holes or solid walls.

The STAKKAbox™ system has a high STRENGTH to WEIGHT ratio. This is due to it's unique patented TWIN WALL design with internal vertical and horizontal support ribs. The vertical ribs provide a high degree of vertical compressive strength which resist the loads applied by vehicles passing over, while the continuous horizontal rib offers a strong resistance to side wall loads from vehicles or ground heave. Through the unique patented TWIN WALL technology each STAKKAbox™ Modula Chamber is capable of withstanding a vertical load in excess of 40 Tonnes.

Advantages

- 40 Tonne vertical loading
- Simple and quick install
- No requirement for concrete surround
- Lightweight sections for manual handling
- Easily adaptable on site without loss of strength
- Life expectancy in excess of 40 years
- Fully recyclable

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STAKKAbox™ Modula Standard size range:

			Cover Ratings and Type Available			
Length	Width	Section Height	Composite	Concrete Infill	Ductile Iron	Cover
300mm	300mm	155mm	B125/C250	B125	D400	B125
450mm	300mm	155mm	B125/C250	B125	C250	B125
450mm	450mm	155mm	B125/C250	B125	B125/C250/ D400	B125
600mm	450mm	155mm	B125/C250	B125	B125/C250/ D400	B125
600mm	600mm	155mm	B125/C250	B125	B125/C250/ D400	B125
750mm	600mm	155mm	N/A	B125	B125/D400	B125
750mm	750mm	155mm	N/A	B125	B125/D400	B125
900mm	450mm	155mm	B125/C250	B125	N/A	B125
900mm	600mm	155mm	B125/C250	B125	B125/D400	B125
900mm	900mm	155mm	B125/C250	B125	B125/D400	B125
1200mm	600mm	155mm	B125/C250	B125	D400	B125
1200mm	675mm	155mm	N/A	B125	B125/D400	B125
1200mm	900mm	155mm	B125	B125	N/A	B125
1200mm	1200mm	155mm	B125/C250	B125	N/A	B125

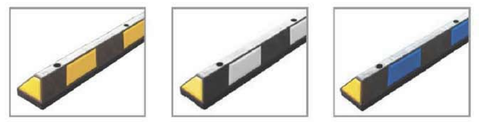
Please note:
It is possible to supply other sizes due to the adaptability of the chamber sidewall sections, these are in 100mm, 150mm, 300mm & 375mm. Any of these sidewall lengths can be used to construct various size chambers i.e. 300mm (corners) + 100mm + 100mm + 375mm = 875mm side wall (clear opening).

Weir Lane, Worcester, WR2 4AY Tel:01905 427100 Fax:01905 427030 Email:sales@nal.ltd.uk

2 D1.3 NAL - MODULAR PULL CHAMBERS
SCALE: NTS

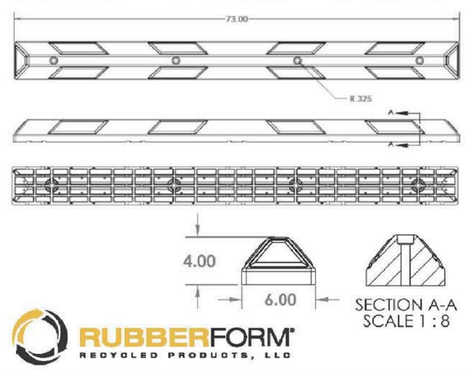
WHEEL STOP SPECIFICATIONS

Models



RF-PLWS-YLW RF-PLWS-WHT RF-PLWS-BLU

RF-PLWS-GRN RF-PLWS-RED RF-PLWS-CUS



RUBBERFORM RECYCLED PRODUCTS, LLC

Specifications

- 23 lbs
- 4"H x 73"L x 6"W
- 4 Mounting Holes with optional rubber caps
- 10 Drainage Channels
- 8 Polygon Stripes and 2 Safety Yellow Endcaps
  - Replacement Polygons available upon request
- Polygon Color Options
  - Safety Yellow
  - Polar White
  - Handicap Blue
  - Eco-Green
  - Emergency Red
  - Custom Color

Hardware Kit

RF-PWSHWK
- 4 - Lag Bolts: 1/2"W x 8"L
- 4 - Lag Shields: 1/2"W x 3"L
- 4 - Washers: 1-1/8"D

RF-RBR14HDG
- 14" Galvanized Forged Mounting Spike with Cap

RF-CLM-1.10.1BK
- Chem-Link M1 structural adhesive for parking decks

75 Michigan St. Lockport, NY 14094 RubberForm.com 716.478.0404 sales@rubberform.com

4 D1.3 RUBBERFORM WHEEL STOPS
SCALE: NTS

Manhole Covers And Frames
Composite B125 Warwick Frame

Applications: Traffic Signals, Street Lighting, Motorway Comms, CCTV, Power and Gas, Telecommunications, Rail Infrastructure, Cable Television, Water Service, Surface Water, Drainage, Permanent Formwork

The NAL standard composite cover range is produced from lightweight yet very strong glass re-enforced Polyester Resin. They are all supplied with our unique non slip tread pattern to the surface side, which exceeds a slip Resistance Value (SRV) of 80. Covers are available in EN124 standard B125 (12.5 Tonne) and C250 (25 Tonne) vertical load capacities. Each composite cover weighs less than 25kgs so poses no problems for manual handling. This is an ideal cover which provides long life with low maintenance costs.

NAL standard composite covers are secured in position by an extra deep galvanised steel raising frame. These maintain the clear opening size required and provide height and tilt adjustment at surface level. All extra deep frames have a minimum of 70mm up-stand to eliminate the need for mortar surround in paved areas. These frames give superior stability to all installations as they enable greater depth of surrounding material. Frames are manufactured from 5mm steel and hot dip galvanised to EN1461.

Advantages

- Extra depth gives frame greater stability
- Available in 12.5 and 25 Tonne vertical loading
- Lightweight for solo lift
- No mortar surround required in paviour areas
- Excellent slip resistance
- Maintenance free
- Frames can be secured internally
- No inherent scrap value

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3 D1.3 NAL - COMPOSITE B125 MANHOLE COVER AND FRAME
SCALE: NTS

JAN 2021	-	ISSUED TO CLIENT
DATE	NO:	REVISION

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
CIVIL DETAILS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	D1.3
DATE:	JANUARY 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ½"=1'-0" ON 11x17 SHEET)

STRUCTURAL NOTES & SPECIFICATIONS

BACKFILL MATERIAL

1. BACKFILL MATERIAL SHALL BE FREE FROM ORGANIC MATTER, CONSTRUCTION DEBRIS AND LARGE ROCKS (GREATER THAN 3"(THREE INCHES)). THE BACKFILL SHALL BE PLACED IN LAYERS, NOT GREATER THAN 8" (EIGHT INCHES), WATERED AND COMPACTED.

2. DO NOT BACKFILL AGAINST WALLS RETAINING EARTH UNTIL ELEMENTS PROVIDING LATERAL SUPPORT ARE COMPLETED. PLACE BACKFILL SIMULTANEOUSLY ON BOTH SIDES OF OTHER WALLS BELOW GRADE.

FOUNDATIONS

3. ALL FOOTING AND FOUNDATIONS TO BEAR ON UNDISTURBED SOUND ROCK OR WELL COMPACTED GRANULAR ENGINEERED FILL COMPACTED TO 98% SPDD. BEARING MATERIAL IS TO REMAIN UNDISTURBED.

4. PROVIDE 2" CONCRETE BLINDING TO FOUNDATIONS PLACED ON COMPACTED FILL.

CONCRETE

5. EXPERIENCED PERSONNEL TO THE SATISFACTION OF THE ENGINEER SHALL MECHANICALLY VIBRATE ALL STRUCTURAL CONCRETE IN THE APPROVED MANNER. ALL CONCRETE TO BE ADEQUATELY VIBRO COMPACTED, ON PLACING, TO ENSURE THAT ALL VOIDS ARE REMOVED.

6. SLABS SHALL NOT HAVE JOINTS IN A HORIZONTAL PLANE UNLESS SHOWN OTHERWISE.

7. ALL REINFORCED CONCRETE TO BE DESIGNED AND DETAILED IN ACCORDANCE WITH NBC 2005, CSA-A23.1 AND CSA-A23.3 UNLESS NOTED OTHERWISE.

8. CEMENT: ASTM C150; TYPE I – CAN3-A23.1, TYPE 10

9. AGGREGATES: ASTM C33 NORMAL WEIGHT.

10. REINFORCED CONCRETE TO HAVE 28 DAY CUBE COMPRESSIVE STRENGTH OF 4,000 psi:

11. MISCELLANEOUS FILL TO BE 2,000 PSI

12. SURFACE FINISH TO SUIT THE ARCHITECTURAL REQUIREMENTS AND CONFIRMED IN THE STRUCTURAL SPECIFICATION.

13. THE QUANTITY OF TEST CYLINDERS CAST BY THE GENERAL CONTRACTOR AND THE AGE AT WHICH THEY ARE TESTED SHALL BE AS DIRECTED BY THE ENGINEER AND CONFIRMED IN THE STRUCTURAL SPECIFICATION.

14. CONCRETE COVER TO REINFORCEMENT TO BE AS FOLLOWS, UNLESS NOTED OTHERWISE:

- WHERE CONCRETE IS CAST DIRECTLY AGAINST AND PERMANENTLY EXPOSED TO EARTH – 3"
- PAD FOUNDATIONS INTERNAL TO PERIMETER BASEMENT WALL:
  TOP – 2"
  BOTTOM AND SIDES – 3"
- PAD & STRIP FOUNDATIONS EXTERNAL TO PERIMETER BASEMENT WALL:
  TOP – 2½"
  BOTTOM AND SIDES – 3"
- CONCRETE ELEMENTS EXPOSED TO WEATHER (PERIMETER COLUMNS AND BEAMS/SLAB EDGES/CANTILEVER SLABS/PERIMETER WALLS/ETC.) – 2 1/2"
- CONCRETE ELEMENTS FORMING THE "WATER TANKS" AND "SEWAGE TREATMENT PLANT":
  EXTERNAL – 3"
  INTERNAL – 2½"
- CONCRETE ELEMENTS ENTIRELY WITHIN THE VAPOUR BARRIER OF THE BUILDING ENVELOPE:
  SLABS – 1½"
  COLUMNS – 2"
  BEAMS – 1½"
  WALLS – 2"

REINFORCING STEEL

16. ALL REINFORCEMENT TO ASTM A615 OR CAN/CSA G30.18M – GRADE 400R HIGH YIELD Fy – 60ksi (400MPa). ALL REINFORCEMENT TO BE HOT DIPPED GALVANISED AND SHOULD BE TREATED WITH A CHROMATE WASH.

17. MINIMUM REINFORCEMENT LAPS TO BE AS FOLLOWS:

T6	= 12" (TWELVE INCHES)
T8	= 15" (FIFTEEN INCHES)
T10	= 18" (EIGHTEEN INCHES)
T12	= 24" (TWENTY FOUR INCHES)
T16	= 32" (THIRTY TWO INCHES)
T20	= 40" (FORTY INCHES)
T25	= 60" (SIXTY INCHES)
WIRE MESH	= 12" (TWELVE INCHES)

18. MESH REINFORCEMENT TO HAVE A MINIMUM LAP OF 18" UNLESS NOTED OTHERWISE. ALL LAPS IN MESH TO BE NESTED.

19. LOCATION OF ALL LAPS SHALL BE SHOWN ON REINFORCEMENT STEEL SHOP DRAWINGS AND SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.

20. ALL LAPS AND INTERSECTIONS OF BARS SHALL BE SECURELY CONNECTED WITH GALVANISED WIRE OF A SUITABLE SIZE OR OTHER APPROVED METHOD OF FIXING.

21. REINFORCEMENT ON SPECIFIC CONTRACTOR'S RC DETAIL DRAWINGS WILL TAKE PRECEDENCE OVER REINFORCEMENT SHOWN ON BRUNEL DRAWINGS. ALL NOTES ON SPECIFIC CONTRACTOR'S RC DETAIL DRAWINGS TO BE CROSS REFERENCED WITH THE FOLLOWING NOTES. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF BRUNEL FOR CONFIRMATION.

22. ALL REINFORCEMENT SHALL BE ACCURATELY PLACED, SECURED AND MAINTAINED IN POSITION. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY STOOLS, CHAIRS, AND SPACERS REQUIRED TO SUPPORT AND RESTRAIN THE REINFORCEMENT.

23. HORIZONTAL CONSTRUCTION JOINTS IN CONCRETE WALLS ARE NOT PERMITTED. LEAVE CHASES AND POCKETS IN WALLS FOR SEATING OF SLABS AND BEAMS.

24. REINFORCEMENT FOR CONCRETE BASES UNDER EQUIPMENT NOT COVERED BY SECTION OR PLAN SHALL BE T10 @12" EACH WAY PLACED 2" BELOW TOP OF CONCRETE.

25. UNLESS OTHERWISE SPECIFIED ON PLANS PROVIDE TEMPERATURE REINFORCEMENT FOR FRAMED ONE-WAY OR TWO-WAY SLABS IN ACCORDANCE WITH TYPICAL DETAILS.

26. BARS MARKED CONTINUOUS SHALL BE TERMINATED IN HOOKS AND DEVELOPED BY CLASS B LAPS WHERE SPLICED.

27. PROVIDE CONTINUOUS GALVANISED VERTICAL DOVETAIL ANCHOR SLOTS IN ALL CONCRETE SURFACES ABUTTING MASONRY WALLS AND AT 2'-0" CENTRES IN ALL CONCRETE SURFACES WITH MASONRY VENEER.

28. CHAMFER ALL EXPOSED CONCRETE CORNERS 3/4" x 3/4" MINIMUM UNLESS NOTED OTHERWISE.

29. INSIDE FACE OF ALL POUR STOP ENDS TO BE COATED WITH CONCRETE RETARDER. CONCRETE FACE IS TO BE POWER WASHED TO PROVIDE A CLEAN AND ROUGHED SURFACE TO FULL AMPLITUDE OF AT LEAST 1/5".

MASONRY WALLS

30. THE AVERAGE COMPRESSIVE STRENGTH OF MASONRY UNITS SHALL BE 2900 PSI BASED ON THE NET AREA OF THE BLOCK CELL. MASONRY UNITS SHALL CONFORM TO ASTM C90. ALL BLOCKWORK SHALL BE LAID IN RUNNING BOND U.N.O.

31. MORTAR SHALL BE 'TYPE S' IN ACCORDANCE WITH ASTM C270.

32. GROUT FOR MASONRY UNITS SHALL BE 3000 PSI CONCRETE WITH AN 8" SLUMP.

33. UNLESS NOTED OTHERWISE PROVIDE BOND BEAM AT TOP OF WALL REINFORCED WITH 2–#4 BARS CONTINUOUS.

34. FILLED BLOCK WALLS SHALL BE CONSTRUCTED IN A MAXIMUM OF 4'–0" HIGH LIFTS. CONCRETE TO BE STOPPED 2" FROM THE TOP OF THE BLOCK TO ALLOW THE NEXT LIFT TO KEY TOGETHER. ENSURE ADEQUATE LAP LENGTH OF VERTICAL REINFORCING IS OBTAINED PRIOR TO FILLING BLOCKS.

35. ALL OPENINGS IN MASONRY WALLS ARE TO BE SPANNED BY REINFORCED CONCRETE LINTELS.

36. MINIMUM BEARING OF REINFORCED CONCRETE LINTELS AND BEAMS ONTO BLOCK WALLS SHALL BE 8" U.N.O.

37. ALL LAP SPLICES IN BLOCK WORK REINFORCING SHALL BE AS NOTED IN REINFORCING STEEL NOTES.

38. BLOCK WALLS BUTTING UP TO CONCRETE PIERS OR COLUMN ENCASEMENTS SHALL BE TOOTHED EVERY 2ND COURSE WITH 8' KEY INTO BLOCK WORK WALL.

39. BLOCK WALLS BUTTING UP TO STEEL FRAMEWORK SHALL BE BONDED EVERY SECOND COURSE WITH APPROVED MECHANICAL FASTNERS.

40. UNLESS NOTED OTHERWISE ALL MASONRY WALLS REQUIRING REINFORCEMENT TO CONSIST OF EITHER:
  A.) 2–T6 BARS AT 16" C/C OR EVERY SECOND COURSE WITH 1½" MIN. COVER FROM THE OUTSIDE OF THE BLOCKS.
  B.) 'DUR-O-WALL' TRUSS TYPE REINFORCING NUMBER 9 GAUGE, GALVANIZED WIRE (OR EQUIVALENT BRICK FORCE MESH). HORIZONTAL REINFORCING IS TO BE PLACED AT 16" C/C (EVERY SECOND COURSE) U.N.O.

LINTELS

41. CONCRETE LINTEL BEAMS SHALL BE PROVIDED TO ALL OPENINGS IN ACCORDANCE WITH THE STRUCTURAL SCHEDULE AT LOCATIONS GIVEN. CHECK ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR OPENINGS REQUIRING STANDARD LINTELS WHICH ARE NOT NECESSARILY SHOWN ON THE STRUCTURAL DRAWINGS.

42. MINIMUM BEARING OF LINTEL BEAMS SHALL BE 8" (EIGHT INCHES), UNLESS NOTED OTHERWISE.

43. UNLESS OTHERWISE NOTED TYPICAL LINTEL BEAM TO BE 10" DEEP x WIDTH OF WALL WITH 3,000 PSI CONCRETE REINFORCED WITH 2 #4 BOTTOM.

44. PROVIDE STANDARD LINTELS OVER ALL OPENINGS IN MASONRY WALLS AS SHOWN ON TYPICAL DETAILS.

45. UNLESS OTHERWISE NOTED ALL BEARING BEAMS SHALL HAVE A MINIMUM BEARING OF 8" AND ALL CONCRETE SLABS SHALL HAVE A MINIMUM BEARING OF 4". VOIDS IN MASONRY UNITS UNDER BEAMS AND JOISTS SHALL BE PRE-FILLED WITH GROUT FOR A MINIMUM VERTICAL DEPTH OF 2–0" AND A LENGTH OF 8" UNLESS OTHERWISE NOTED. USE 75% SOLID BLOCK FOR FILLING. DO NOT USE MORTAR TO FILL MASONRY UNITS.

WALL SCHEDULE

TYPE	DETAILS
W1	HOLLOW CONCRETE BLOCK WALL. SEE THICKNESS OF WALL ON PLANS.
	EXISTING WALL

WALL NOTES

1. BLOCKWORK WALLS THAT ARE BELOW GRADE AND CELLS THAT ARE REINFORCED ARE TO BE SOLID FILLED WITH 3000psi CONCRETE. CELLS ARE TO BE CLEANED OUT PRIOR TO FILLING.
2. CONCRETE FILL TO BE PLACED IN MAXIMUM OF 4'–0" HIGH LIFTS WITH THE POUR STOPPING 2" BELOW THE TOP OF THE BLOCK CELL TO ALLOW THE NEXT LIFT TO KEY TOGETHER. REINFORCING BARS ARE TO EXTEND A MINIMUM LAP LENGTH ABOVE THE TOP OF THE POUR.
3. CONCRETE WALLS TO BE PLACED IN CONTINUOUS OPERATIONS TO AVOID COLD JOINTS.

SLAB SCHEDULE

TYPE	DETAILS
S1	6" THK. SLAB ON GRADE ON 6 MIL POLY ON WELL COMPACTED SUB-GRADE REINFORCED WITH A-142 MESH (1½" FROM TOP).
S2	6" CONCRETE PLYFORMED SLAB REINFORCED w/ T12 BARS @ 8" ⅝ IN SHORT SPAN DIRECTION INDICATED BY ARROWS ON PLAN AND T12 @ 8" ⅝ TRANSVERSE BARS (ALL BARS TO BE 1½" FROM BOTTOM).

SLAB NOTES

1. CONSTRUCTION JOINTS IN SLABS TO BE KEPT TO A MINIMUM AND WHERE NECESSARY BE CENTERED OVER BEAMS AND ARE TO BE SQUARE AND VERTICAL. REINFORCEMENT TO BE CONTINUED THROUGH JOINTS A MINIMUM LAP LENGTH.
2. SLABS ARE TO BE CURED FOR A MINIMUM OF 7 DAYS BY KEEPING CONTINUOUSLY MOIST.
3. 3. SLABS AND REINFORCING TO BEAR A MINIMUM OF 4" ONTO NEW BEAMS, 4" ONTO BLOCKWORK WALLS, OR 6" ONTO BERMUDA STONE WALLS.
4. EXTERIOR SLABS TO BE LAID TO FALLS AWAY FROM BUILDING WITH A MINIMUM SLOPE OF 2% . THICKNESS SHOWN IN TABLES IS MINIMUM DEPTH OF SLAB. INCREASE AS NECESSARY TO ACHIEVE THE DESIRED FALLS.

FOUNDATION SCHEDULE

TYPE	DETAILS
SF1	24" WIDE x 12" DEEP CONCRETE STRIP FOOTING REINFORCED WITH 3–T12 LONGITUDINAL REBARS AND T10 @ 16" ⅝ TRANSVERSE REBARS (3" CONCRETE COVER).

FOUNDATION NOTES

1. ALL FOUNDATION TO BEAR ON UNDISTURBED BEDROCK. CONTACT REGISTERED ENGINEER IF CONDITIONS ARE DIFFERENT.
2. TAKE FOOTINGS DOWN TO BEDROCK AND THEN CONSTRUCT BACK UP TO UNDERSIDE OF SLAB LEVEL WITH SOLID FILLED BLOCKWORK WALLS.
3. CAST STARTER BARS INTO FOOTINGS TO MATCH VERTICAL WALL OR COLUMN STEEL. 12" HORIZONTAL LEGS, VERTICAL LEG LENGTH AS NECESSARY TO MEET MINIMUM LAP LENGTH AS PER TABLE.
4. COVER TO FOOTING STEEL TO BE 3"
5. AT ALL INTERSECTIONS AND CORNERS OF FOOTINGS, INSTALL 2–T16 'L' BARS WITH 36" LEGS

ROOF SCHEDULE

TYPE	MAX SPAN	RAFTER SIZE & SPACING	COLLAR TIE SIZE & SPACING	COLLAR TIE HEIGHT 'X'	COLLAR TIE CONNECTION
R1	6'–0"	2"x6" @ 16" ⅝	N/A	N/A	N/A

GENERAL NOTES ON ROOF CONSTRUCTION

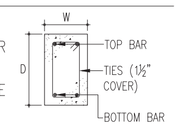
1. BERMUDA STONE ROOF CONSTRUCTION ON 1"x2" WOODEN BATTENS.
2. TIMBER CONSTRUCTION SHALL CONFORM TO AITC. NATIONAL DESIGN SPECIFICATIONS AND BERMUDA BUILDING CODE (LATEST EDITION). TIMBER TO BE TYPE "STRUCTURAL LIGHT FRAMING, No. 2" SOUTHERN YELLOW PINE (PITCH PINE).
3. ALL TIMBER TO BE WOLMANIZED TYPE, PRESSURE TREATED.
4. ALL STEEL NUTS, BOLTS AND WASHERS ARE TO BE HOT DIP GALVANIZED CONFORMING TO ASTM A-325. BOLT HOLES SHALL BE NO LARGER THAN 1/16" GREATER THAN THE NOMINAL BOLT SIZE. ALL BOLTED JOINTS SHALL HAVE WASHERS FITTED UNDER THE HEAD OF THE BOLT AND UNDER EACH NUT. THE SIZE OF THE WASHERS SHALL BE FOR 1/2" BOLTS AND UNDER: 2" ø x 1/8" THICK; AND, FOR 5/8" BOLTS: 2 1/2" ø x 3/16" THICK.
5. WALL PLATE 3"x4"
6. HIP RAFTERS: UNLESS OTHERWISE INDICATED ON PLAN SIZE AS COMMON RAFTERS (IN EXCESS OF 16'–0" LONG USE DOUBLE COMMON RAFTERS)
7. UNLESS NOTED OTHERWISE BOLT DOUBLE RAFTERS TOGETHER WITH ½" Ø BOLTS AT 1'–4" ⅝, BOLTS STAGGERED VERTICALLY.
8. RIDGE BOARDS 1"x8" FOR 6" RAFTERS, 1"x10" FOR 8" RAFTERS, AND 1"x12" FOR 10" OR 12" RAFTERS.
9. RIDGE POLE: FOR PEAK ROOFS 4"x4"
10. TIMBER STRINGERS: 2"x6" MIN. FIXED TO WALL WITH ⅜"Ø BOLTS AT 2'–6" ⅝ RAFTERS TO BE SIDE FIXED TO STRINGERS WITH JOIST HANGERS WHERE EXPOSED BELOW.
11. UNLESS NOTED OTHERWISE CRIPPLE BOARDS TO BE 1"x10" FOR 6" AND 8" RAFTERS, AND 1"x12" FOR 10" OR 12" RAFTERS.
12. UNLESS NOTED OTHERWISE FIX WALL PLATE TO RING BEAM WITH ½" Ø BOLTS IN 1" Ø HOLES THROUGH WALL PLATE AT 4'–0" ⅝ USING 2" SQ. x 0.25" THICK PLATE WASHERS UNDER NUTS (BOLTS SET MIN. 4" INTO CONC. RING BEAM).
13. FIX EACH RAFTER TO WALL PLATE WITH FULLY NAILED 'SIMPSON STRONG TIE' HURRICANE CLIPS TYPE H2.5A PER RAFTER UNLESS NOTED OTHERWISE.
14. ALL NAILS FOR PERMANENT WORK TO BE GALVANIZED.
15. ALL BOLTS TO BE GALVANIZED STEEL OR STAINLESS STEEL.
16. EAVE SLATE: STANDARD PC CONC. UNITS FIXED W/ 2–NO. 2½" NO.10 BRASS SCREWS.
17. RAINWATER GLIDES: 3"x4" STANDARD PC CONC. GUTTER STONES.
18. MINIMUM CLEARANCE OF TIMBER TO CHIMNEY: 1½".

CONCRETE LINTEL SCHEDULE

TYPE	SPAN	W x D	REINFORCEMENT	TIES
L–1	SEE PLAN	'wow' x 6"	2–T12 (BTM)	–
L–2	SEE PLAN	'wow" x 6"	2–T12 (BTM) & 2–T12 (BTM)	T6 @ 4" CTS.
L–3	SEE PLAN	8" x 8"	3–T12 (BTM) & 3–T16 (BTM)	T6 @ 6" CTS.
BB–1	SEE PLAN	'wow' x 8"	2–T12 (MIDDLE)	

LINTEL NOTES

1. " TYPICAL LINTELS WHERE NOT OTHERWISE INDICATED.
2. ALL LINTEL TYPES SHOWN INDICATE LINTEL ABOVE FLOOR LEVEL.
3. ENSURE THAT EXISTING WALLS, FLOORS, AND ROOFS ARE SECURELY PROPPED PRIOR TO DEMOLITION OPERATIONS AND INSTALLATION OF BEAMS.
4. ABBREVIATIONS: NOI: NOT OTHERWISE INDICATED, WOW: WIDTH OF WALL IN WIDTH, UNO: UNLESS NOTED OTHERWISE
5. CONCRETE BEAMS AND LINTELS ARE TO HAVE A MAXIMUM OF 8" BEARING EITHER SIDE. REINFORCING IS TO CONTINUE A MINIMUM OF 6" OVER SUPPORTS, AT CORNERS AND INTERSECTIONS, HOOK BARS 36".
6. BLOCK CELLS BELOW EACH END OF BEAMS AND LINTELS ARE TO BE SOLID FILLED DOWN TO SLAB LEVEL.
7. WHEN POURING BELT BEAM, ALLOW CONCRETE TO EXTEND A MINIMUM OF 4" DOWN INTO BLOCK CELLS BELOW.
8. BOND BEAM REINFORCING IS TO BE EXTENDED INTO AND BE CONTINUOUS WITH ALL INTERSECTING BOND BEAMS.



SEPT 2021	1	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT
DATE	NO:	REVISION

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PROJECT:

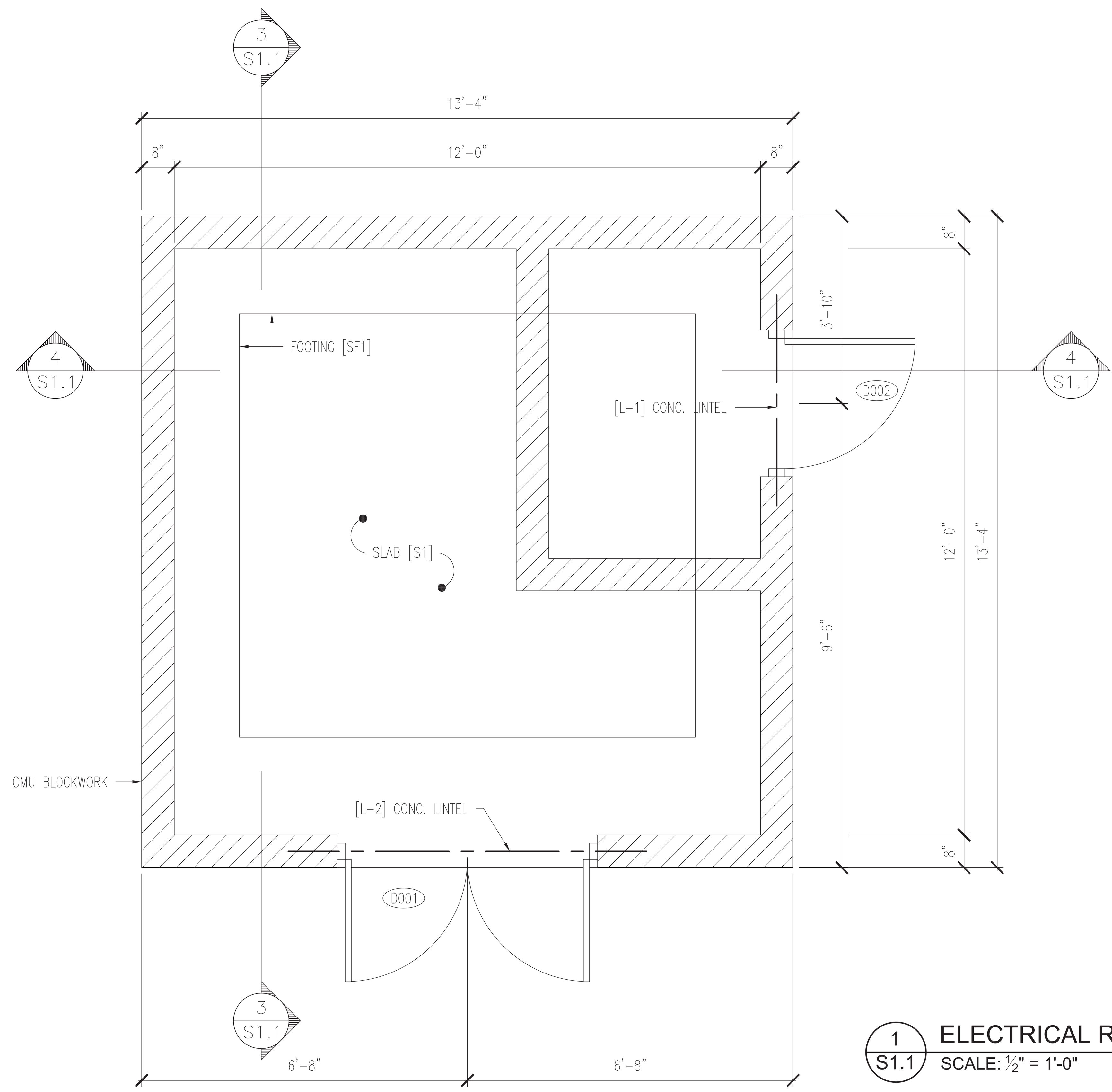
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:

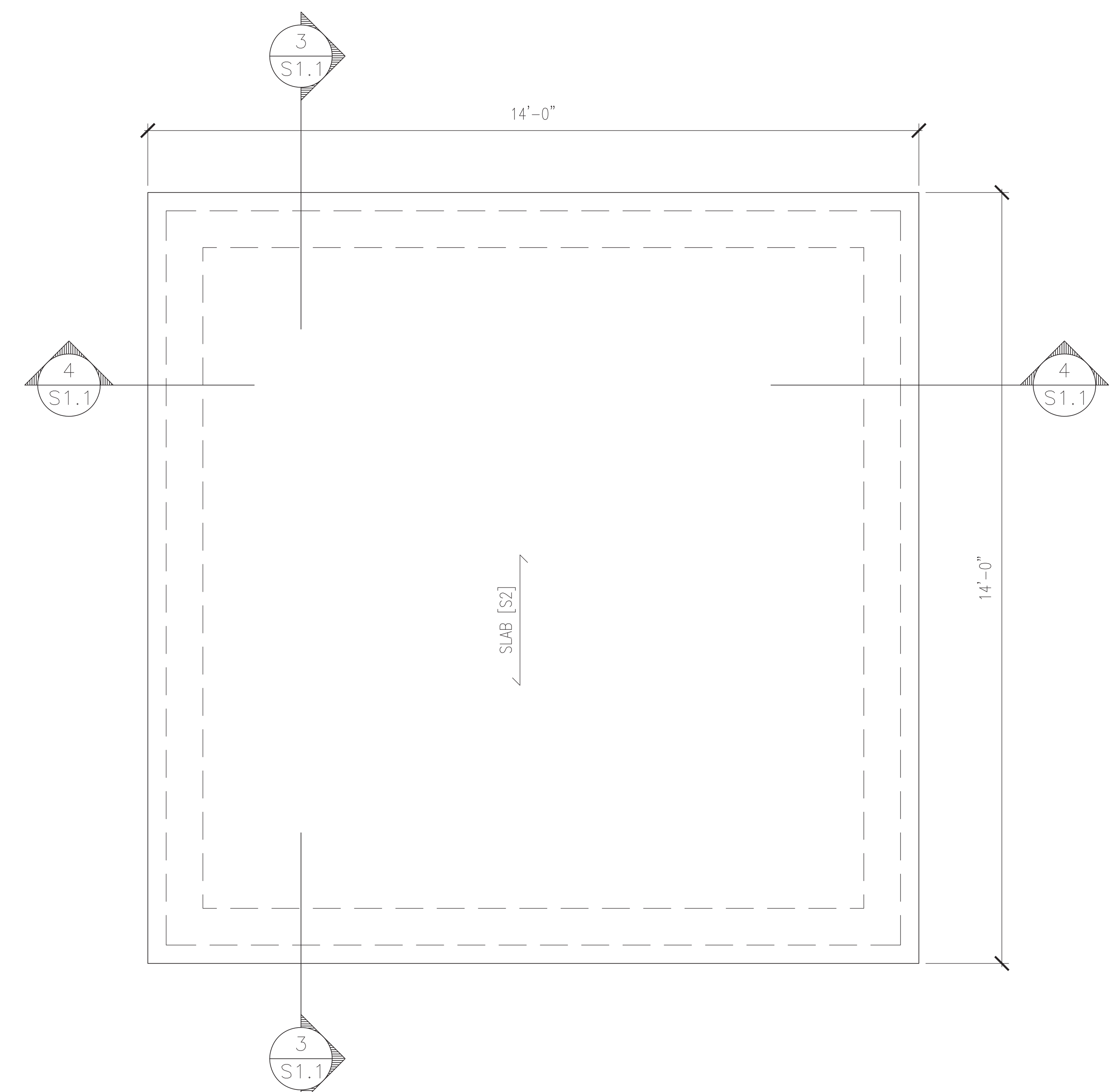
GENERAL STRUCTURAL NOTES AND SCHEDULES

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	**S.0**
DATE:	JANUARY 2021		

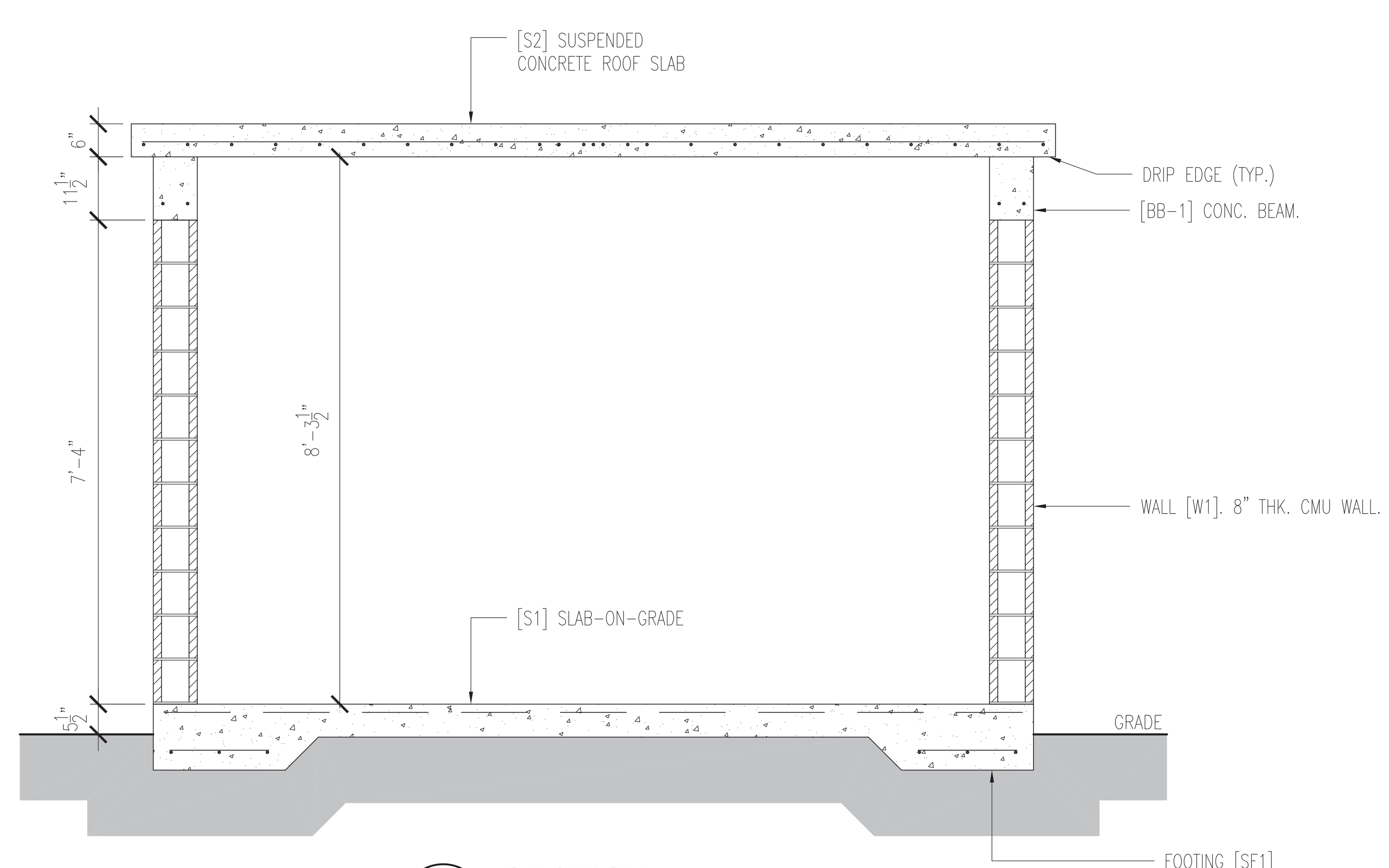
DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ⅛"=1'-0" ON 11x17 SHEET)



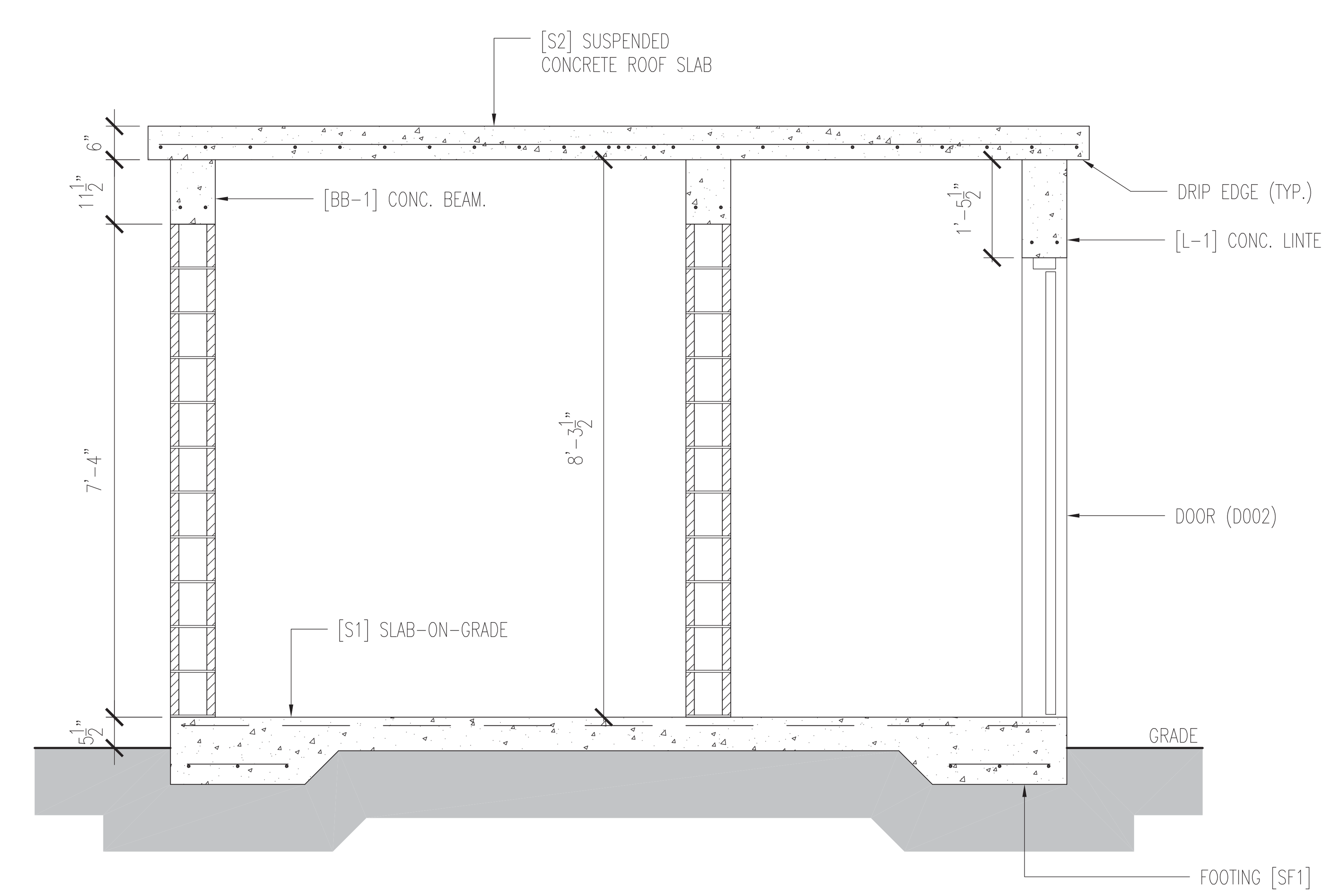
1 S1.1 ELECTRICAL ROOM - FLOOR PLAN
SCALE: ½" = 1'-0"



2 S1.1 ELECTRICAL ROOM - ROOF PLAN
SCALE: ½" = 1'-0"



3 S1.1 SECTION
SCALE: ½" = 1'-0"



4 S1.1 SECTION
SCALE: ½" = 1'-0"

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
ELECTRICAL ROOM
PLANS & SECTIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JC	DRAWING #:	S1.1
DATE:	SEPTEMBER 2021		

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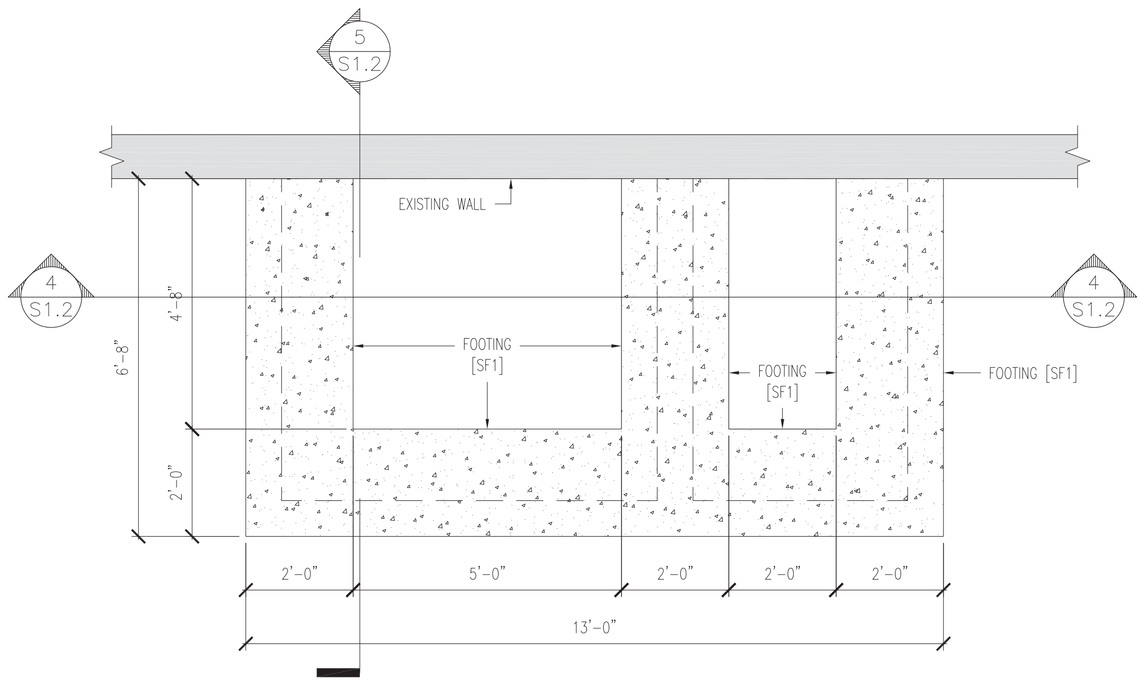
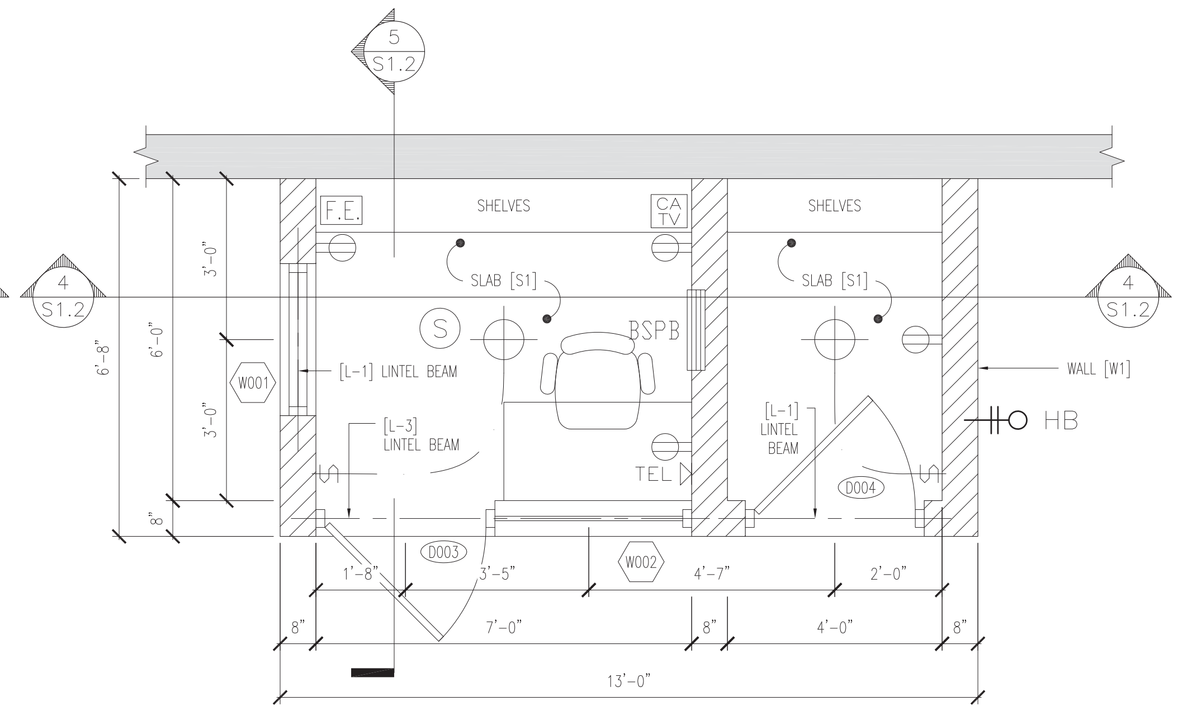
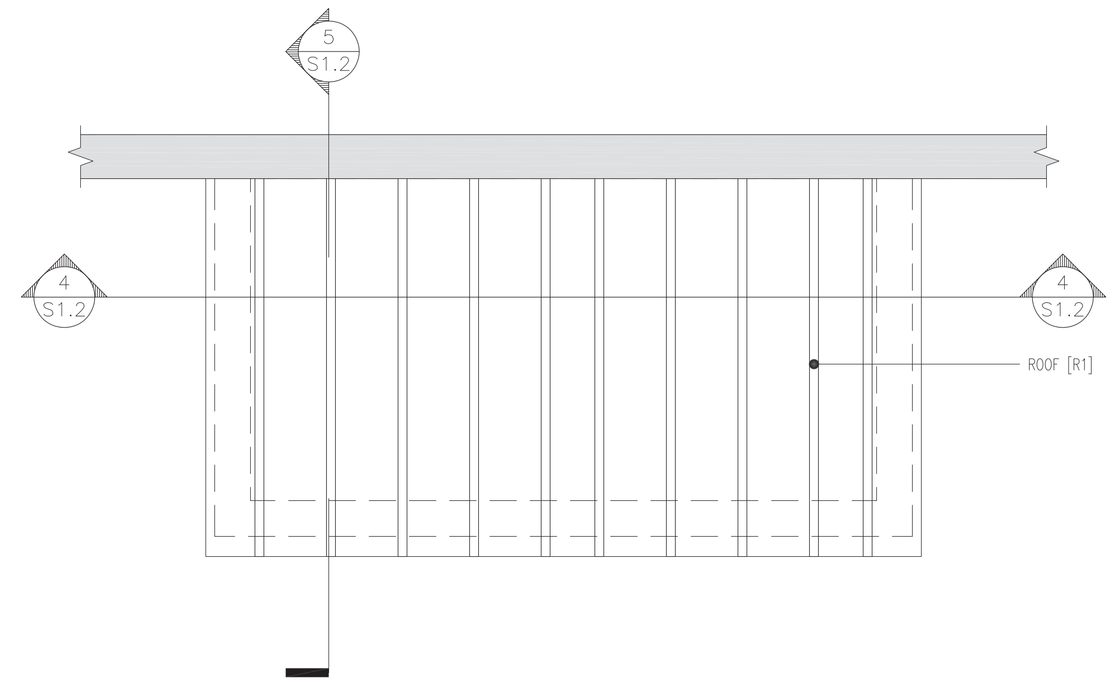


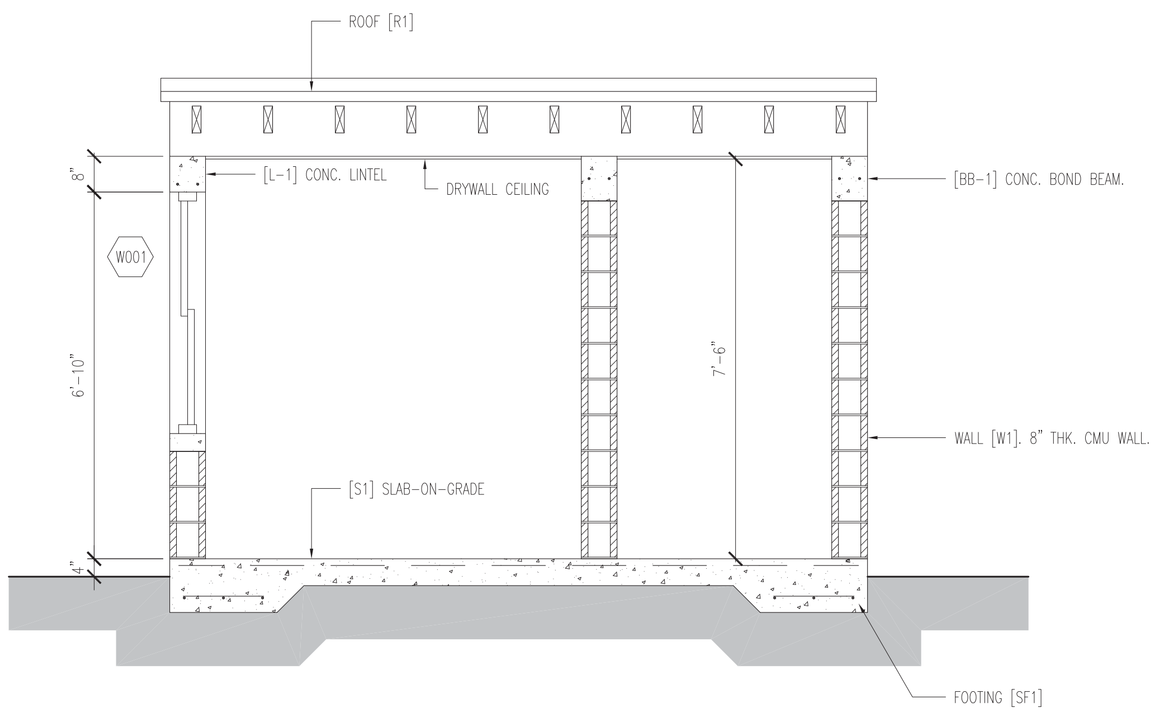
1 S1.2 **FOUNDATION PLAN**
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)



2 S1.2 **GROUND FLOOR PLAN**
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)



3 S1.2 **ROOF FRAMING PLAN**
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)



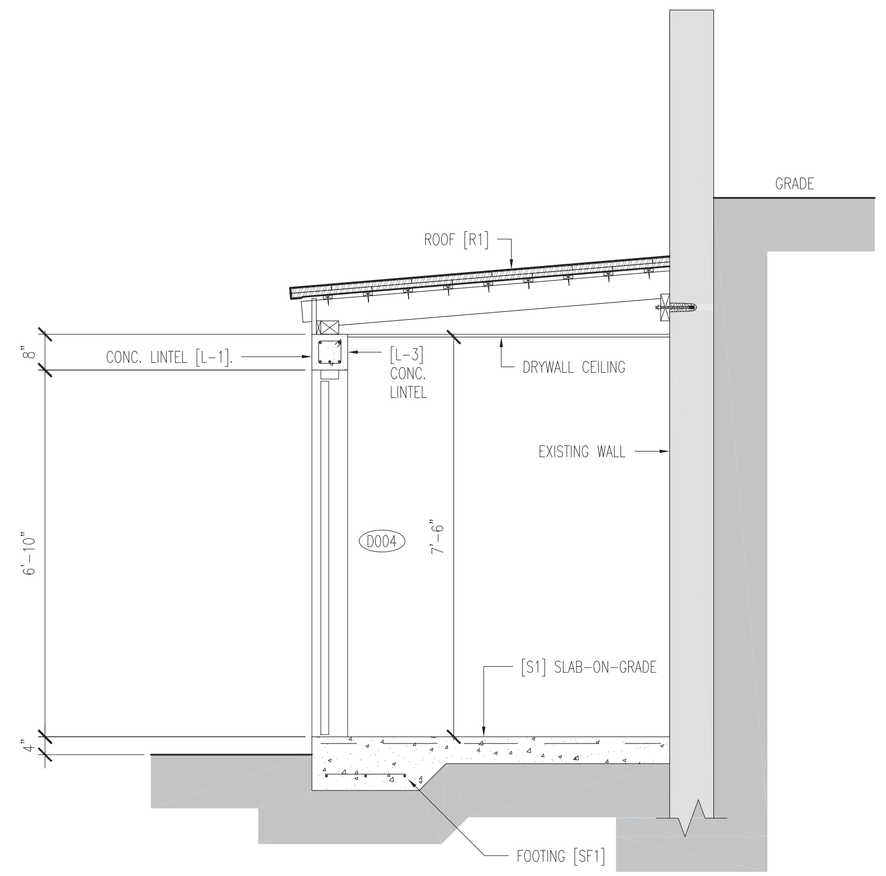
4 S1.2 **SECTION**
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)

ELECTRICAL LEGEND

BLOCK	DESCRIPTION
	SINGLE POLE SWITCH
	DUPLEX OUTLET
	CEILING MOUNTED LIGHT
F.E.	FIRE EXTINGUISHER: APPROVED AGENCY, MINIMUM 2.5 lb CAPACITY, OF TYPE A, B & C
S	SMOKE DETECTOR
TEL	TELEPHONE JACK
BSPB	PANEL BOX

PLUMBING KEY

BLOCK	DESCRIPTION
HB	HOSE BIB



5 S1.2 **SECTION**
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)

REGISTERED PROFESSIONAL CIVIL ENGINEER No. 129 JAIME H. PEMBERTON 10/19/2021 BERMUDA

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

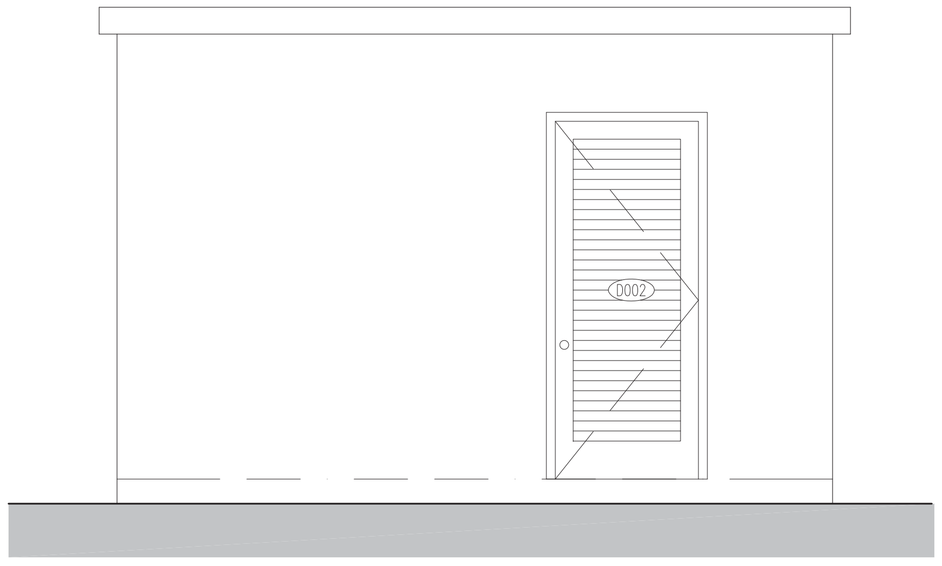
TITLE:
GUARD HOUSE & STORE ROOM
PLAN AND SECTIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JC	DRAWING #:	**S1.2**
DATE:	SEPTEMBER 2021		

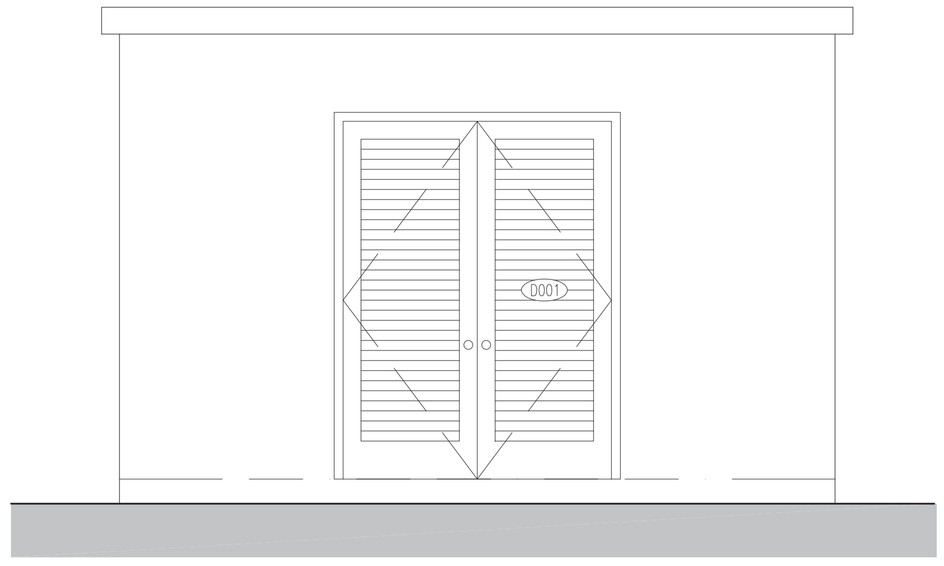
DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11"x17" SHEETS ARE HALF SCALE SHOWN (1/4"=1'-0" ON 24"x36" SHEET = 1/8"=1'-0" ON 11"x17" SHEET)

1 S2.1 ELEVATION (SOUTH)
SCALE: ½" = 1'-0"

2 S2.1 ELEVATION (WEST)
SCALE: ½" = 1'-0"



3 S2.1 ELEVATION (EAST)
SCALE: ½" = 1'-0"



4 S2.1 ELEVATION (NORTH)
SCALE: ½" = 1'-0"

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PROJECT:
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REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
ELECTRICAL ROOM
ELEVATIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JC	DRAWING #:	**S2.1**
DATE:	SEPTEMBER 2021		

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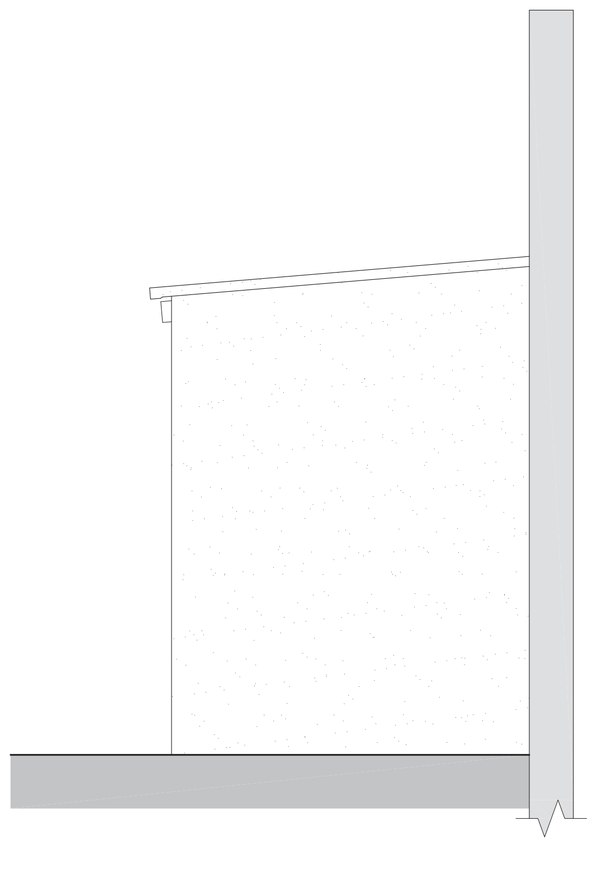
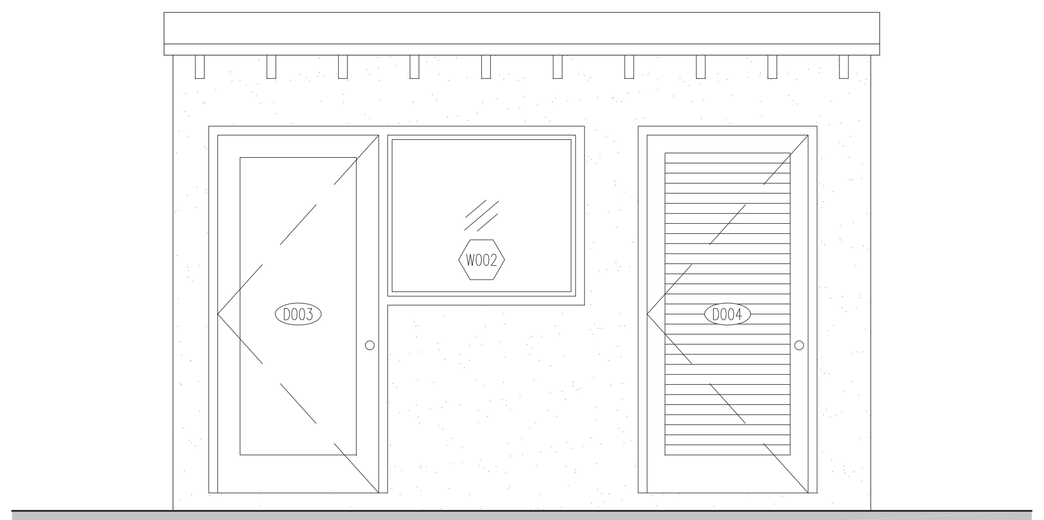
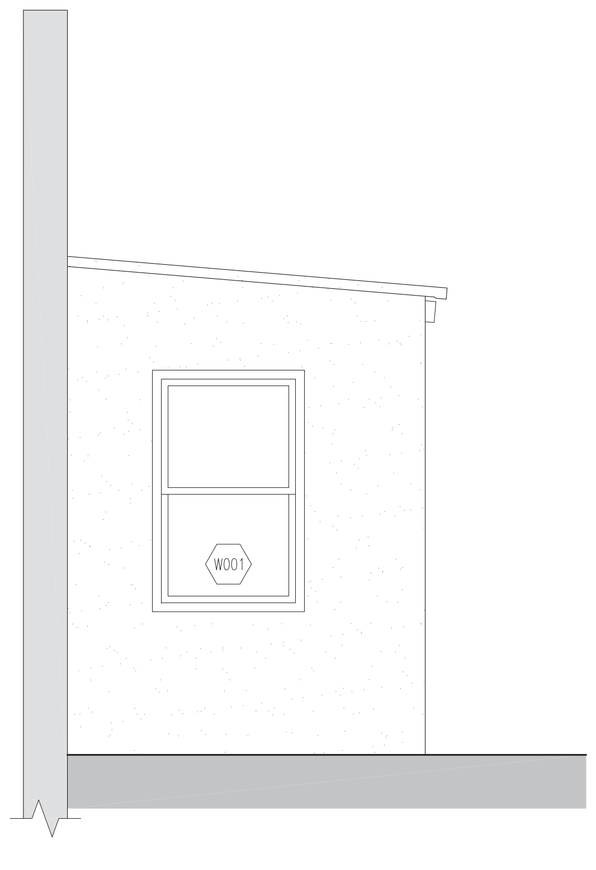


1 S2.2 WESTERN ELEVATION
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)



2 S2.2 NORTHERN ELEVATION
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)



3 S2.2 EASTERN ELEVATION
SCALE: ¼" = 1'-0" (11x17 SHEET)
½" = 1'-0" (24x36 SHEET)

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PROJECT:
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REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

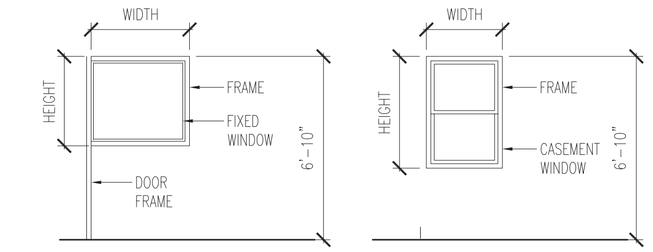
TITLE:
GUARD HOUSE & STORAGE
ELEVATIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JC	DRAWING #:	**S2.2**
DATE:	SEPTEMBER 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11"x17" SHEETS ARE HALF SCALE SHOWN (1/4"=1'-0" ON 24"x36" SHEET = 1/8"=1'-0" ON 11"x17" SHEET)

WINDOW SCHEDULE

DOORS					FRAME				GLAZING	REMARKS
WINDOW NUMBER	OPENING SIZE (WxH)	TYPE	MATERIAL	FINISH	MATERIAL	FINISH	ROOM NAME	WINDOW PANES		
UPPER FLOOR										
W001	3'-8" x 3'-4"	W1	PVC	FACTORY	PVC	FACTORY	GUARD HOUSE	DOUBLE GLAZED 1 / 1		
W002	2'-10" x 4'-6"	W2	PVC	FACTORY	PVC	FACTORY	GUARD HOUSE	PLEXIGLAS		



WINDOW TYPE 'W1'

• FIXED WINDOW

WINDOW TYPE 'W2'

• DOUBLE HUNG WINDOW

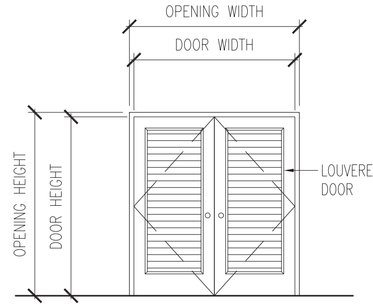
1 S3.1 WINDOW SCHEDULE

SCALE: N.T.S.

DOOR & HARDWARE SCHEDULE

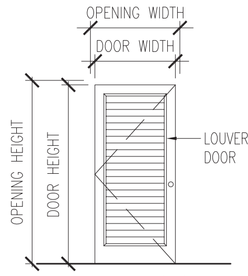
DOORS													FRAME			LOCATION	HARDWARE									
DOOR NUMBER	DOOR SIZE	OPENING SIZE	TYPE	SWING	SLIDE	BI-FOLD	THICKNESS	RATING	MATERIAL	FINISH	GLASS PANEL	LOUVERED	RATING	MATERIAL	FINISH	ROOM NAME	LEVER	PULL	PUSH PLATE	CLOSER	FLOOR STOP	OVERHEAD STOP	ENTRY LOCKSET LEVER	PASSAGE LOCKSET LEVER	STOREROOM LOCKSET LEVER	NOTES
GROUND FLOOR																										
D001	5'-0" x 6'-8"	5'-4" x 6'-10"	D1	X			1¾"	–	PVC	FACTORY		X	–	PVC	FACTORY	ELECTRICAL ROOM	X			X			X			
D002	2'-8" x 6'-8"	3'-0" x 6'-10"	D2	X			1¾"	–	PVC	FACTORY		X	–	PVC	FACTORY	ELECTRICAL ROOM CLOSET	X						X			
D003	3'-0" x 6'-8"	3'-4" x 6'-10"	D3	X			1¾"	–	PVC	FACTORY	X		–	PVC	FACTORY	GUARD HOUSE	X			X			X			DOUBLE GLAZED
D004	3'-0" x 6'-8"	3'-4" x 6'-10"	D2	X			1¾"	–	PVC	FACTORY		X	–	PVC	FACTORY	STORE ROOM	X						X			

NOTES:
1. ALL DOOR HINGES, PULLS, PUSH PLATES, AND LEVERS TO BE MARINE GRADE STAINLESS STEEL (GRADE 316).



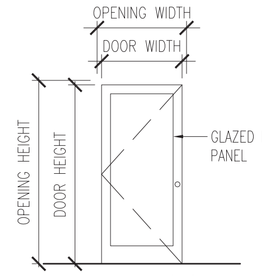
DOOR TYPE 'D1'

• PVC EXTERIOR LOUVERED DOOR



DOOR TYPE 'D2'

• PVC EXTERIOR LOUVERED DOOR



DOOR TYPE 'D3'

• PVC FRENCH DOOR

2 S3.1 DOOR SCHEDULE

SCALE: N.T.S.

SEP. 2021	-	ISSUED TO BUILDING CONTROL
DATE	NO:	REVISION

BRUNEL ENGINEERING CONSULTANTS

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PROJECT:

DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:

WINDOW AND DOOR SCHEDULE
ELEVATIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JC	DRAWING #:	**S3.1**
DATE:	SEPTEMBER 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11"x17" SHEETS ARE HALF SCALE SHOWN (1/4"=1'-0" ON 24"x36" SHEET = 1/8"=1'-0" ON 11"x17" SHEET)

NOTES AND SPECIFICATIONS

GENERAL

1. THESE NOTES APPLY TO ALL CIVIL DRAWINGS.

2. DO NOT SCALE THE DRAWINGS. CONTRACTOR SHALL REVIEW AND DETERMINE THAT DIMENSIONS ARE COORDINATED BETWEEN ARCHITECTURAL AND CIVIL DRAWINGS PRIOR TO START OF CONSTRUCTION.

3. UNLESS NOTED OTHERWISE THE CONTRACTOR SHALL SUPPLY ALL THE NECESSARY MATERIALS TO COMPLETE THE WORK.

4. THE PLANS AND SPECIFICATIONS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE APPLICABLE BUILDING CODE, LATEST ADOPTED EDITION.

5. CONSTRUCTION SHALL REMAIN WITHIN THE PROPERTY OF THE OWNER OR IS WITHIN THE RIGHT-OF-WAY OF DEDICATED STREETS. THE CONTRACTOR SHALL LIMIT HIS OPERATIONS TO THE STREET RIGHT-OF-WAY, EASEMENT, OR BOUNDARY OF THE OWNER'S PROPERTY UNLESS HE MAKES A SEPARATE ARRANGEMENT WITH THE LANDOWNER FOR THE USE OF ADDITIONAL LAND.

6. THE CONTRACTOR SHALL CONSTRUCT THE WORKS IN STRICT ACCORDANCE TO THE PLAN LOCATIONS AND ELEVATION REQUIREMENTS AS SHOWN THE CONTRACT DRAWINGS.

EXCAVATION, EARTHWORK, AND GRADING

7. CONTRACTOR SHALL VERIFY THE LOCATIONS OF EXISTING UTILITIES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. IF SITE CONDITIONS DIFFER FROM WHAT IS EXPECTED, CONSULT WITH ENGINEER OR ARCHITECT.

8. EXCAVATION WORKS INCLUDE EXCAVATING, CLEARING, GRUBBING, HAULING, HANDLING AND PLACING, SHAPING, COMPACTING, AND TRIMMING OF EARTH, FILL, ROCK, ASPHALT, CONCRETE, SMALL TREES, STUMPS, BUSHES, TRASH, AND ALL OTHER MATERIALS OR OBJECTS ENCOUNTERED DURING CONSTRUCTION.

9. ALL OBSERVATION OF EXCAVATION AND GRADING SHALL BE PERFORMED BY THE ENGINEER. ALL EXCAVATED AREAS SHALL BE INSPECTED BY THE ENGINEER PRIOR TO THE PLACEMENT OF ANY FILL THEREON. NO EXCAVATIONS IN CUT AREAS SHALL BE EXTENDED BELOW THE PLAN GRADE OR PLAN SUBGRADE ELEVATION WITHOUT THE APPROVAL OF THE ENGINEER.

10. TOPSOIL SHALL BE REMOVED AND STOCKPILED FOR LATER USE. ALL SURPLUS MATERIAL SHALL BE DISPOSED OF AT LEGAL DUMPSITES OR A SPECIFIED LOCATION AS DESIGNATED BY THE OWNER.

11. EXCAVATION AND REMOVAL OPERATIONS SHALL BE PERFORMED IN SUCH A MANNER AS TO LEAVE UNDISTURBED ANY AREAS NOT DESIGNATED FOR CONSTRUCTION ON THE PLANS.

12. WHERE A REMOVAL OR EXCAVATED AREA REQUIRES FILLING OR A RESULTING TRENCH, HOLE, OR PIT, BACKFILLING SHALL BE TO THE REQUIRED GRADE USING EITHER SUITABLE EXCAVATED MATERIALS OR IMPORTED MATERIALS AS REQUIRED. BACKFILL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 8" CONFORMING TO THE SPECIFIED COMPACTION REQUIREMENTS.

13. SUITABLE MECHANICAL SAWING EQUIPMENT OR PAVEMENT MILLING EQUIPMENT, CAPABLE OF PRODUCING A STRAIGHT, CLEAN, VERTICAL FACE, SHALL BE USED FOR CUTTING THE FULL DEPTH PAVEMENT.

14. DURING PAVEMENT REMOVAL, CONTAMINATION WITH GRANULAR AND OTHER FOREIGN MATERIALS SHALL BE MINIMIZED.

15. ALL ROCK CUTS GREATER THAN 6' (SIX FEET) IN HEIGHT SHALL BE CERTIFIED BY A REGISTERED STRUCTURAL ENGINEER.

16. ALL EARTH EMBANKMENTS SHALL BE BUILT USING A LAYER COMPACTION METHOD. THE EMBANKMENT MATERIAL SHALL BE SPREAD IN UNIFORM FULL WIDTH LAYERS NOT MORE THAN 12 INCHES IN DEPTH PRIOR TO COMPACTION. EACH LAYER SHALL BE SHAPED AND COMPACTED TO THE LINE AND CROSS SECTION SPECIFIED BEFORE THE SUCCEEDING LAYER IS PLACED. STONES GREATER THAN THE FULLY COMPACTED LAYER DEPTH SHALL BE REMOVED. MATERIAL IN EACH LAYER SHALL BE COMPACTED AT MOISTURE CONTENT DETERMINED BY THE ENGINEER TO BE SUITABLE FOR OBTAINING THE REQUIRED DENSITY AND BE COMPACTED.

17. THE AREAS TO BE TOPSOILED AND SEEDED SHALL BE LEFT BETWEEN 12-18" LOWER THAN FINISHED GRADE AS INDICATED.

GRANULAR MATERIAL

18. BACKFILL MATERIAL SHALL BE FREE FROM ORGANIC MATTER, CONSTRUCTION DEBRIS AND LARGE ROCKS (GREATER THAN 3"(THREE INCHES)). THE BACKFILL SHALL BE PLACED IN LAYERS, NOT GREATER THAN 8" (EIGHT INCHES), WATERED AND COMPACTED.

19. USE OF EXCAVATED MATERIAL AS BACKFILL SHALL BE AT THE DISCRETION OF THE ENGINEER.

20. GRANULAR SUB-BASE MATERIAL SHALL CONSIST OF 2" CRUSHED LIMESTONE OR FINE TO MEDIUM SAND COMPACTED AT 100% SPMDD.

21. GRANULAR BASE MATERIAL SHALL CONSIST OF ¾" CRUSHER RUN LIMESTONE COMPACTED AT 100% SPMDD.

22. GRANULAR BEDDING SHALL CONSIST OF WELL GRADED SAND AND GRAVEL (MINUS ¾" INCH) OR ¾" INCH CLEAR CRUSHED STONE COMPACTED TO 100% SPMDD.

BACKFILLING AND COMPACTION

23. ALL PIPELINE EXCAVATIONS SHALL BE BACKFILLED TO RESTORE PRE-EXISTING CONDITIONS AS THE MINIMUM REQUIREMENT, AND FULFILL ALL SUPPLEMENTARY REQUIREMENTS INDICATED IN THE PLANS AND SPECIFICATIONS. THE BACKFILLING OPERATIONS SHALL BE STARTED AS SOON AS CONDITIONS WILL PERMIT ON EACH SECTION OF PIPELINE, SO AS TO PROVIDE CONTINUITY IN SUBSEQUENT OPERATIONS AND RESTORE NORMAL PUBLIC SERVICE AS SOON AS PRACTICABLE ON A SECTION-BY-SECTION BASIS. ALL OPERATIONS SHALL BE PURSUED DILIGENTLY, WITH PROPER AND ADEQUATE EQUIPMENT, AS WILL ASSURE ACCEPTABLE RESULTS.

24. BACKFILL MATERIALS SHALL BE CAREFULLY PLACED IN RELATIVELY UNIFORM DEPTH LAYERS SPREAD OVER THE FULL WIDTH AND LENGTH OF THE TRENCH SECTION TO PROVIDE SIMULTANEOUS SUPPORT ON BOTH SIDES OF THE PIPELINE. EACH LAYER SHALL BE COMPACTED EFFECTIVELY, BY APPROVED MECHANICAL METHODS BEFORE PLACING MATERIAL FOR A SUCCEEDING LAYER THEREON. WITHIN THE PIPE BEDDING/ENCASEMENT ZONE COMPACTION SHALL BE IN A MINIMUM OF THREE LIFTS: INVERT TO SPRING LINE, SPRING LINE TO TOP OF PIPE, AND TOP OF PIPE TO 1.0 FOOT OVER TOP OF PIPE. MAXIMUM THICKNESS OF ANY COMPACTION LIFT SHALL BE 8 INCHES COMPACTED THICKNESS.

25. UNLESS SPECIFIED OTHERWISE, BACKFILLING SHALL BE IN MAXIMUM 8 INCH LIFTS (COMPACTED THICKNESS)

26. BACKFILL MATERIAL BEHIND RETAINING WALLS SHALL BE FREE FROM ORGANIC MATTER, CONSTRUCTION DEBRIS AND LARGE ROCKS (GREATER THAN 3"(THREE INCHES)). THE BACKFILL SHALL BE PLACED IN LAYERS, NOT GREATER THAN 6" (SIX INCHES), WATERED AND COMPACTED.

27. DO NOT BACKFILL AGAINST WALLS RETAINING EARTH UNTIL ELEMENTS PROVIDING LATERAL SUPPORT ARE COMPLETED. PLACE BACKFILL SIMULTANEOUSLY ON BOTH SIDES OF OTHER WALLS BELOW GRADE.

28. COMPACTION REQUIREMENTS ARE:

    98% SPMDD – GENERAL SUBGRADE
    98% SPMDD – LANDSCAPED AREAS (TOP 6")
    100% SPMDD – SUBGRADE UNDER PADS
    100% SPMDD – PIPE BEDDING
    95% SPMDD – PIPE ENCASEMENT ZONE
    95% SPMDD – WITHIN UPPER 5' BELOW ROAD SUBBASE
    98% SPMDD – WITHIN UPPER 2' BELOW ROAD SUBBASE
    100% SPMDD – ROAD SUBBASE
    100% SPMDD – ROAD BASE
    97% MARSHALL DENSITY – ASPHALT PAVING

    SPMDD = STANDARD PROCTOR MAXIMUM DRY DENSITY

    TESTING FREQUENCY SHALL CONSIST OF:

    MINIMUM ONE (1) IN-PLACE DENSITY AND MOISTURE TEST PER 8 INCH LIFT PER 2000 SF OF FILL AREAS. ONE (1) STANDARD PROCTOR TEST SHALL BE PERFORMED PER TYPE OF MATERIAL BACKFILL.

    MINIMUM ONE (1) IN-PLACE DENSITY AND MOISTURE TEST PER 8 INCH LIFT PER 150 LF OF TRENCH. ONE (1) STANDARD PROCTOR TEST SHALL BE PERFORMED PER TYPE OF MATERIAL BACKFILL.

    MINIMUM ONE (1) IN-PLACE DENSITY AND MOISTURE TEST PER LIFT PER 500 LF OF ROAD BASE AND SUBBASE. ONE (1) STANDARD PROCTOR TEST SHALL BE PERFORMED PER BASE AND SUBBASE MATERIAL.

29. THE MOISTURE CONTENT OF ALL BACKFILL MATERIALS WHEN TESTED SHALL NOT BE LESS THAN 1% BELOW AND NOT MORE THAN 3% ABOVE THE OPTIMUM MOISTURE CONTENT.

30. ALL SURPLUS OR WASTE MATERIALS REMAINING AFTER COMPLETION OF THE BACKFILLING OPERATIONS SHALL BE DISPOSED OF IN AN ACCEPTABLE MANNER AFTER COMPLETING THE BACKFILL WORK. DISPOSAL AT ANY LOCATION WITHIN THE PROJECT LIMITS SHALL BE AS SPECIFIED, OR AS APPROVED IN WRITING BY THE ENGINEER; OTHERWISE, DISPOSAL SHALL BE ACCOMPLISHED OUTSIDE THE PROJECT LIMITS AT THE CONTRACTOR'S OWN DUMP SITE.

31. COMPACTION TESTING OF ALL BACKFILLED MATERIALS SHALL BE VIA THE NUCLEAR DENSOMETER METHOD. ALL TESTING SHALL BE WITNESSED AND CERTIFIED BY THE CLIENT INSPECTOR.

FOUNDATIONS

32. ALL FOOTING AND FOUNDATIONS TO BEAR ON UNDISTURBED SOUND ROCK. BEARING MATERIAL IS TO REMAIN UNDISTURBED AND BE REVIEWED BY THE ENGINEER PRIOR TO PLACING CONCRETE FOR FOOTING AND FOUNDATIONS. WHERE THE PRESENCE OF ROCK IS EXPECTED BUT NOT DETECTED, THE STRUCTURAL ENGINEER SHALL BE RETAINED TO PROVIDE ALTERNATIVE DETAILS.

33. EXPERIENCED PERSONNEL TO THE SATISFACTION OF THE ENGINEER SHALL MECHANICALLY VIBRATE ALL STRUCTURAL CONCRETE IN THE APPROVED MANNER. THE CONTRACTOR SHALL HAVE AT LEAST TWO FULLY OPERATIONAL POKER VIBRATORS ON SITE DURING CONCRETE PLACEMENT.

34. NO SPLICES OF REINFORCEMENT SHALL BE PERMITTED EXCEPT AS DETAILED OR AUTHORIZED BY THE STRUCTURAL ENGINEER. MAKE BARS CONTINUOUS AROUND CORNERS. WHEN PERMITTED, SPLICES SHALL BE MADE BY CONTACT TENSION LAP SPLICES, UNLESS OTHERWISE NOTED.

35. ALL INSERTS AND SLEEVES SHALL BE CAST-IN-PLACE WHENEVER FEASIBLE. DRILLED OR POWDER DRIVEN FASTNERS WILL BE PERMITTED WHEN PROVEN TO THE SATISFACTION OF THE STRUCTURAL ENGINEER THAT THE FASTNERS WILL NOT SPALL THE CONCRETE AND HAVE THE SAME CAPACITY AS CAST-IN-PLACE INSERTS.

36. WHEN INSTALLING EXPANSION BOLTS OR ADHESIVE ANCHORS, TAKE MEASURES TO AVOID DRILLING OR CUTTING OF ANY EXISTING REINFORCING AND DESTRUCTION OF CONCRETE. HOLES SHALL BE BLOWN CLEAR PRIOR TO PLACING BOLTS OR ADHESIVE ANCHORS.

37. CONCRETE SLABS SHALL BE FINISHED FLAT AND LEVEL WITHIN TOLERANCE TO THE ELEVATION INDICATED ON THE DRAWINGS. CONTRACTOR SHALL PROVIDE ADDITIONAL CONCRETE REQUIRED DUE TO FORMWORK AND FRAMING DEFLECTION TO ACHIEVE THIS TOP OF SLAB ELEVATION.

38. FOUNDATION WALLS AND SLABS SHALL NOT HAVE JOINTS IN A HORIZONTAL PLANE UNLESS SHOWN OTHERWISE.

CONCRETE

39. ALL CONCRETE WORK SHALL CONFORM TO ACI 301 (LATEST EDITION), SPECIFICATION FOR STRUCTURAL CONCRETE FOR BUILDINGS OR APPROVED EQUIVALENT STANDARD.

40. CONCRETE SHALL BE MECHANICALLY COMPACTED IN AN APPROVED MANNER.

41. CEMENT: ASTM C150; TYPE I – CAN3-A23.1, TYPE 10

42. AGGREGATES: ASTM C33 NORMAL WEIGHT.

43. NO ADMIXTURES SHALL BE PERMITTED UNLESS APPROVED BY THE ENGINEER.

44. STRUCTURAL CONCRETE SHALL ACHIEVE A MINIMUM CUBE COMPRESSIVE STRENGTH AT 28 DAYS AS FOLLOWS UNLESS NOTED OTHERWISE.

FOOTINGS	= 3000 PSI
SLABS ON GRADE	= 3000 PSI
RETAINING WALLS	= 3000 PSI
THRUST BLOCKS	= 3000 PSI
MISCELLANEOUS FILL	= 2000 PSI

45. CONCRETE COVER TO BARS SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE:
    - 3" FOR CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH. FOUNDATIONS, RETAINING WALLS.
    - 2" FOR CONCRETE EXPOSED TO WEATHER .
    - 1½ " FOR CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND. SLABS, WALLS, BEAMS, COLUMNS.

46. THROUGHOUT THEIR ENTIRE LENGTH, FORMS SHALL BE SET TRUE THE LINES AND GRADES SPECIFIED IN THE PLANS AND IN DIRECT CONTACT WITH THE SUBGRADE OR GRANULAR BASE.

47. CONCRETE SHALL BE PLACED, CONSOLIDATED, AND FINISHED IN A MANNER THAT ENSURES UNIFORM CONSISTENCY.

48. CONCRETE HAULING TIME SHALL NOT EXCEED 120 MINUTES.

49. CONCRETE SHALL BE PLACED BY A CONTINUOUS POUR METHOD. PUMPING OF CONCRETE IS PERMITTED WITH APPROVED EQUIPMENT AND MIX.

50. CONCRETE SHALL NOT BE PLACED AGAINST ANY MATERIAL WHICH IS AT A TEMPERATURE ABOVE 35 DEGREES CELSIUS.

51. CONTRACTOR TO ENSURE THAT REINFORCEMENT AND INSERTS (CHAIRS) ARE NOT DISTURBED DURING CONCRETE PLACEMENT.

52. DEVELOPMENT OF COLD JOINTS IS NOT PERMITTED.

53. LOCALIZED DEFECTS SHALL BE REPAIRED USING CONCRETE.

54. CONCRETE TESTING FOR POURED IN PLACE CONCRETE SHALL CONSIST OF COMPRESSIVE CYLINDER TESTS AT 7 DAYS, 14 DAYS, AND 28 DAYS. TEST RESULTS SHALL BE SUBMITTED TO ENGINEER FOR REVIEW WITHIN 48 HOURS OF COMPLETION OF RESPECTIVE TESTS.

REINFORCING STEEL

55. ALL STEEL BARS SHALL BE GALVANIZED WITH A MINIMUM YIELD STRESS OF 60,000 PSI UNLESS NOTED OTHERWISE.

56. UNLESS NOTED OTHERWISE, MINIMUM ALLOWABLE LAP LENGTHS TO REBAR SHALL BE:
    T6 = 12" (TWELVE INCHES)
    T8 = 15" (FIFTEEN INCHES)
    T10 = 18" (EIGHTEEN INCHES)
    T12 = 24" (TWENTY FOUR INCHES)
    T16 = 32" (THIRTY TWO INCHES)
    T20 = 40" (FORTY INCHES)
    T25 = 60" (SIXTY INCHES)
    WIRE MESH = 12" (TWELVE INCHES)

57. LOCATION OF ALL LAPS SHALL BE SHOWN ON REINFORCEMENT STEEL SHOP DRAWINGS AND SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.

58. REBAR SHALL CONFORM TO ASTM-767 GRADE 60 GALV. WELDED WIRE FABRIC (MESH) SHALL CONFORM TO ASTM-A-185.

MASONRY WALLS

59. THE AVERAGE COMPRESSIVE STRENGTH OF MASONRY UNITS SHALL BE 2000 PSI BASED ON THE NET AREA OF THE BLOCK CELL. MASONRY UNITS SHALL CONFORM TO ASTM C90. ALL BLOCKWORK SHALL BE LAYED IN RUNNING BOND U.N.O.

60. MORTAR SHALL BE 'TYPE S' IN ACCORDANCE WITH ASTM C270.

61. GROUT FOR MASONRY UNITS SHALL BE 3000 PSI CONCRETE WITH AN 8" SLUMP.

62. FILLED BLOCK WALLS SHALL BE CONSTRUCTED IN A MAXIMUM OF FIVE COURSE LIFTS. CONCRETE TO BE STOPPED 2" FROM THE TOP OF THE BLOCK TO ALLOW THE NEXT LIFT TO KEY TOGETHER. ENSURE ADEQUATE LAP LENGTH OF VERTICAL REINFORCING IS OBTAINED PRIOR TO FILLING BLOCKS.

63. ALL OPENINGS IN MASONRY WALLS ARE TO BE SPANNED BY REINFORCED CONCRETE LINTELS.

64. MINIMUM BEARING OF REINFORCED CONCRETE LINTELS AND BEAMS ONTO BLOCK WALLS SHALL BE 8" U.N.O.

65. ALL LAP SPLICES IN BLOCK WORK REINFORCING SHALL BE AS NOTED IN REINFORCING STEEL NOTES.

66. BLOCK WALLS BUTTING UP TO CONCRETE PIERS OR COLUMN ENCASEMENTS SHALL BE TOOTHED EVERY 2ND COURSE WITH 8" KEY INTO BLOCK WORK WALL.

67. UNLESS NOTED OTHERWISE ALL MASONRY WALLS REQUIRING HORIZONTAL REINFORCEMENT TO CONSIST OF EITHER:
    A.) 2-T6 BARS AT 16" C/C OR EVERY SECOND COURSE WITH 3" MIN. COVER FROM THE OUTSIDE OF THE BLOCKS.
    B.) "DUR-O-WALL" TRUSS TYPE REINFORCING NUMBER 9 GAUGE, GALVANIZED WIRE (OR EQUIVALENT BRICK FORCE MESH).
    HORIZONTAL REINFORCING IS TO BE PLACED AT 16" C/C (EVERY SECOND COURSE) U.N.O.

68. UNLESS NOTED OTHERWISE ALL WALLS ARE TO RECEIVE A CAP BEAM ON TOP. CAP BEAMS ARE TO BE WIDTH OF WALL WIDE x 8" DEEP REINFORCED WITH 2-T12 BARS CONTINUOUS. CAP BEAM REINFORCING IS TO BE EXTENDED INTO AND BE CONTINUOUS WITH ALL INTERSECTING CAP BEAMS.

SIDEWALKS

69. CONCRETE SHALL CONFORM TO THE FOLLOWING:

    – CLASS OF CONCRETE: 3,500 PSI AT 28 DAYS
    – COARSE AGGREGATE: ½" NOMINAL MAX SIZE
    – MAXIMUM SLUMP: 2-1/2" +/- ¾"

70. CURING COMPOUND SHALL CONFORM TO ASTM C309-93.

71. SUBGRADE TOLERANCE: FINISHED SUBGRADE SHALL BE WITHIN A ½" DEVIATION MEASURED AT ANY POINT ON A 10'-0" LONG STRAIGHT EDGE.

72. SIDEWALK TOLERANCE: FINISHED SIDEWALK SHALL BE WITHIN A ¼" DEVIATION MEASURED AT ANY POINT ON A 10'-0" LONG STRAIGHT EDGE.

73. THE MINIMUM ACCEPTABLE THICKNESS OF THE SIDEWALK SHALL BE THE SPECIFIED THICKNESS MINUS 5/8". IF THE THICKNESS DEFICIENCY EXCEEDS 5/8", THE SIDEWALK SHALL BE REMOVED AND REPLACED.

74. BEFORE PLACING CONCRETE ON GRANULAR BASE, THE GRANULAR IMMEDIATELY AHEAD OF THE CONCRETE PLACING OPERATION SHALL BE WETTED DOWN THOROUGHLY. THE WETTING DOWN SHALL BE CARRIED OUT WITHOUT LEAVING STANDING WATER.

75. ALTERNATIVELY A SUBGRADE MOISTURE VAPOUR BARRIER MAY BE PLACED TO COMPLETELY COVER THE SUBGRADE UNDER THE SIDEWALK. ADJACENT STRIPS SHALL BE LAPPED 4" MINIMUM AND ENDS SHALL BE LAPPED 12" MINIMUM.

76. THROUGHOUT THEIR ENTIRE LENGTH, FORMS SHALL BE SET TRUE TO THE LINES AND GRADES SPECIFIED IN THE CONTRACT AND IN DIRECT CONTACT WITH THE SUBGRADE OR GRANULAR BASE.

77. WORK DONE ON ADJUSTMENT OF MANHOLES, VALVE CHAMBERS AND CATCH BASINS SHALL CONFORM TO SPECIFICATION FOR THESE STRUCTURES. UTILITY APPURTENANCES SHALL BE ADJUSTED FLUSH WITH HE SURFACE OF THE NEW SIDEWALK. FRAME TOPS AND GRATE SURFACES SHALL BE THOROUGHLY CLEANED.

78. CONCRETE SHALL BE PLACED, CONSOLIDATED AND FINISHED IN A MANNER THAT ENSURES UNIFORM CONSISTENCY. ANY EXCESS CONCRETE BEYOND THE SIDEWALK EDGE SHALL BE REMOVED.

79. CONCRETE SHALL BE PLACED BY A CONTINUOUS POUR METHOD. WHERE CONCRETE PLACING IS INTERRUPTED FOR MORE THAN 45 MINUTES, A ½" THICK BITUMINOUS FIBREBOARD JOINT FILLER SHALL BE INSTALLED VERTICALLY ACROSS THE SIDEWALK WIDTH BEFORE RESUMING CONCRETE PLACING.

80. CONCRETE SHALL NOT BE PLACED AGAINST ANY MATERIAL WHICH IS AT A TEMPERATURE ABOVE 35°C.

81. NOTWITHSTANDING THE ABOVE REQUIREMENTS, THE FINAL APPEARANCE OF ALL SIDEWALKS SHALL BE SIMILAR TO THOSE EXISTING SIDEWALKS IN DOCKYARD.

82. FINISHING OF THE CONCRETE SURFACE SHALL TAKE PLACE WHILE IT IS SUFFICIENTLY PLASTIC TO ACHIEVE THE DESIRED GRADES, ELEVATIONS AND TEXTURE.

83. THE SURFACE SHALL BE UNIFORM, DENSE, FREE FROM UNDULATIONS AND PROJECTIONS, AND SHALL BE STRUCK OFF TRUE TO GRADE AND CROSS SECTION AND SHALL BE FINISHED WITH A FLOAT. EXCESSIVE FINES AND WATER SHALL NOT BE DRAWN TO THE SURFACE.

84. SURFACE RETARDERS SHALL NOT BE USED AS AN AID FOR FINISHING CONCRETE.

85. THE APPLICATION OF WATER, CEMENT, OR A COMBINATION OF SIMILAR MIXTURES TO THE CONCRETE SURFACE WILL NOT BE PERMITTED AS A FINISHING AID.

86. LOCALIZED DEFECTS SHALL BE REPAIRED USING CONCRETE.

87. THE TOP SURFACE OF SIDEWALKS SHALL BE GIVEN A BROOMED FINISH.

88. THE PRESENCE OF FOOTPRINTS OR OTHER MARKS IN THE COMPLETED SIDEWALK SHALL REQUIRE SAWCUTTING, REMOVAL AND REPLACEMENT OF THE COMPLETE SIDEWALK BAY.

89. LONGITUDINAL AND TRANSVERSE JOINTS SHALL BE CONSTRUCTED OF THAT TYPE AND AT THE LOCATIONS SPECIFIED IN THE CONTRACT. THE CONCRETE ADJACENT TO ALL FORMWORK AND JOINTS SHALL BE FINISHED WITH A TOOL THAT PRODUCES A 1/8" ROUNDED EDGE AND A SMOOTH, HORIZONTAL SURFACE WITH A MAXIMUM WIDTH OF 2". ALL TOOLING SHALL BE UNIFORM AND STRAIGHT, AND SHALL BE DEPRESSED TO A MAXIMUM OF 1/16" BELOW THE ADJACENT SURFACE. ANY RIDGES ALONG THE TOOLED MARKS SHALL BE REMOVED.

90. DUMMY JOINTS SHALL BE HAND FORMED USING A 1/8" RADIUS DUMMY JOINT TOOL.

91. CONTRACTION JOINTS SHALL BE PLACED AT EVERY THIRD DUMMY JOINT AND SHALL BE SAWCUT OR FORMED TO A DEPTH WHICH IS 0.25 OF THE SIDEWALK THICKNESS.

92. WHEN THE SIDEWALK WIDTH IS 8'-0" OR GREATER, AS IT IS BEHIND EACH NEW BUS LAY-BY, A LONGITUDINAL CONTRACTION JOINT SHALL BE SAWN OR FORMED AT A MAXIMUM SPACING INTERVAL OF 5'-0".

93. EXPANSION JOINTS SHALL BE CONSTRUCTED TO THE FULL DEPTH OF THE SLAB.

94. EXPANSION JOINTS SHALL BE FILLED WITH EXPANSION JOINT MATERIAL AND SHALL BE CLEAN AND DRY AT THE TIME OF CONSTRUCTION.

95. EXPANSION JOINTS SHALL BE CONSTRUCTED WHERE THE SIDEWALK ABUTS A RIGID OBJECT OR CHANGES DIRECTION.

96. CONCRETE CURING SHALL BE APPLIED TO ALL EXPOSED FACES AS SOON AFTER THE TEXTURIZING OPERATION AS CAN BE ACHIEVED WITHOUT DAMAGING THE SURFACE. THE SIDES OF EXPOSED FACES SHALL BE SPRAYED WITH THE WHITE PIGMENTED CURING COMPOUND.

97. VEHICULAR AND PEDESTRIAN TRAFFIC SHALL BE RESTRICTED FROM CROSSING THE SIDEWALK AFTER THE CONCRETE HAS BEEN PLACED FOR A MINIMUM PERIOD OF THREE DAYS OR UNTIL THE CONCRETE HAS REACHED 75% OF THE SPECIFIED 28-DAY COMPRESSIVE STRENGTH.

98. CORE SAMPLES OF THE FINISHED CONCRETE MAY BE TAKEN TO ESTABLISH THE ACTUAL THICKNESS OF THE SLAB AT LOCATIONS DETERMINED BY THE ENGINEER.

REGISTERED PROFESSIONAL CIVIL ENGINEER No. 128 JAMES R. RENSHAW 10/19/2021 BERMUDA

SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT
DATE	NO:	REVISION

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
PROJECT SPECIFICATIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	SP1.0
DATE:	JAN 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ⅛"=1'-0" ON 11x17 SHEET)

99. UNACCEPTABLE AREAS OF SIDEWALK IDENTIFIED BY THE ENGINEER SHALL REQUIRE THE SAWCUTTING, REMOVAL AND REPLACEMENT OF THE COMPLETE BAY OF SIDEWALK BY THE CONTRACTOR.

ASPHALT PAVING

100. ASPHALT MIX DESIGN SHALL CONFORM TO LATEST MINISTRY OF WORKS & ENGINEERING STANDARDS.

101. MECHANICAL PAVERS SHALL BE SELF–PROPELLED AND CAPABLE OF LAYING A CONSISTENT, SATISFACTORY MAT WHICH IS TRUE TO THE SPECIFIED GEOMETRY, CROSS–SECTION AND ALIGNMENT. PAVERS SHALL BE EQUIPPED WITH HOPPERS, AND DISTRIBUTING SCREWS CAPABLE OF PLACING THE MIXTURE EVENLY IN FRONT OF THE SCREEDS. SCREEDS SHALL BE CAPABLE OF BEING HEATED AND BEING ADJUSTABLE AS TO LEVEL AND CROWN. PAVERS SHALL BE CAPABLE OF SIMULTANEOUSLY PLACING THE SHOULDER PAVEMENT AND ROADWAY PAVEMENT WHERE THE SHOULDER PAVEMENT IS AT A DIFFERENT CROSSFALL FROM THE ROADWAY PAVEMENT.

102. IN ALL CASES, PAVERS SHALL BE EQUIPPED WITH AUTOMATIC LONGITUDINAL AND TRANSVERSE GRADE AND SLOPE CONTROLS WHICH ARE CAPABLE OF BEING OPERATED FROM EITHER SIDE OF THE PAVER. THE LONGITUDINAL GRADE CONTROL SHALL BE READILY ADJUSTABLE FOR MAT THICKNESS IN SMALL INCREMENTS WITHOUT THE NECESSITY TO STOP THE PAVER AND SHALL BE EQUIPPED TO OPERATE FROM EITHER A SKI WITH MAXIMUM LENGTH OF 9 M OR FLOATING BEAM, A 3M SKI, OR A JOINT MATCHING SHOE AS REQUIRED. WHERE THE SKI IS A FLEXIBLE UNIT, IT SHALL BE EQUIPPED WITH A SPRING–TENSIONED WIRE EXTENDING BETWEEN BRACKETS FITTED ON AND SLIGHTLY ABOVE EACH END OF THE SKI. THE SENSING GRID SHALL RIDE ON THE WIRE, NOT ON THE SKI.

103. PLOWS OR OTHER EDGE RAMPING DEVICES WHICH ARE ATTACHED TO OR TOWED BY THE SCREED PORTION OF THE PAVER SHALL NOT BE PERMITTED TO AVOID SEGREGATION OF THE MIXTURE DURING HAND SPREADING.

104. ALL ROLLERS SHALL BE CAPABLE OF REVERSING WITHOUT BACKLASH.

105. PRIOR TO PLACING ANY COURSE OF HOT MIX ON A GRANULAR GRADE, A CONVENTIONAL STEEL–TIRED ROLLER HAVING A MINIMUM MASS OF 7 T, OR AN EQUIVALENT VIBRATORY ROLLER WITH A DRUM WIDTH OF AT LEAST 1.2 M, SHALL BE USED TO FINISH ROLL THE GRADE AHEAD OF THE PAVER TO ENSURE A COMPACTED, SMOOTH AND FLOAT–FREE SURFACE. THIS ROLLER SHALL OPERATE CONTINUOUSLY WITHIN 300 M OF THE PAVER.

106. PRIOR TO PLACING PADDING, PATCHING OR PAVEMENT, ALL EXISTING ASPHALT AND CONCRETE SURFACES AND PREVIOUSLY LAID COURSES SHALL BE CLEANED OF ALL LOOSE, BROKEN AND FOREIGN MATERIAL.

107. ALL PAVEMENT SURFACES WHICH ARE TO BE COVERED WITH HOT MIX SHALL BE TACK COATED WITH SS–1 ASPHALT EMULSION DILUTED WITH AN EQUAL VOLUME OF WATER. THE DILUTED SS–1 EMULSION SHALL BE APPLIED TO THE SURFACE IMMEDIATELY FOLLOWING THE CLEANING OF THE SURFACE, AT THE RATE OF 0.35 KG/M^2. THE EMULSION SHALL BE APPLIED EVENLY, BY MEANS OF A PRESSURE DISTRIBUTOR.

108. TACK COAT SHALL BE APPLIED AHEAD OF THE PAVER TO ACCOMMODATE NO MORE THAN 2 H OF PRODUCTION OF THE HOT MIX AND TRAFFIC SHALL BE PREVENTED FROM TRAVELLING UPON THE TACK COAT. HOT MIX SHALL NOT BE PLACED UPON THE TACK COATED AREAS UNTIL THE TACK COAT HAS DRIED TO A CONDITION OF TACKINESS.

109. DELIVERY OF HOT MIX TO THE SITE SHALL BE SCHEDULED SUCH THAT SPREADING AND COMPACTING OF THE HOT MIX IS COMPLETED BY ONE–HALF HOUR AFTER SUNSET. COMMUNICATION BETWEEN THE PAVING OPERATION AND THE PLANT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND INABILITY TO CONTROL THE DELIVERY OF THE MIXTURE OR TO MAKE CHANGES IN THE COMPOSITION OF THE MIXTURE WILL NOT BE CAUSE FOR ACCEPTANCE OF THE WORK WHICH DOES NOT CONFORM TO REQUIREMENTS OF THE CONTRACT, NOR WILL IT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY FOR REJECTED LOADS.

110. PADDING SHALL BE CARRIED OUT TO CORRECT GEOMETRIC DEFICIENCIES ON THE SURFACE OF THE EXISTING PAVEMENT.

111. THE MIXTURE SHALL BE LAID ONLY UPON A BASE WHICH IS FREE OF STANDING WATER. NOT LESS THAN 300 M OF PREPARED GRADE SHALL BE MAINTAINED AHEAD OF THE PAVER. THIS REQUIREMENT SHALL BE WAIVED AT THE END OF THE LANE, OR AT THE END OF THE PAVING OPERATION FOR THAT DAY.

112. THE SURFACE OF THE EXISTING PAVEMENT OR PREVIOUSLY LAID COURSE, UPON WHICH HOT MIX IS TO BE PLACED, SHALL BE DRY AT THE TIME OF PLACING THE HOT MIX.

113. THE TEMPERATURE OF THE MIXTURE IMMEDIATELY AFTER SPREADING AND PRIOR TO INITIAL ROLLING SHALL NOT BE LESS THAN 115°C.

114. IMMEDIATELY AFTER EACH COURSE IS LAID AND BEFORE ROLLER COMPACTION IS STARTED, DEFICIENCIES IN THE SURFACE GEOMETRICS AND MATERIAL TEXTURE SHALL BE CORRECTED. IRREGULARITIES IN ALIGNMENT AND GRADE ALONG THE OUTSIDE EDGES SHALL BE CORRECTED.

115. BINDER AND SURFACE COURSES SHALL BE LAID BY MEANS OF MECHANICAL SELF–PROPELLED PAVERS.

116. THE LONGITUDINAL ALIGNMENT OF THE SPREADER SHALL BE CONTROLLED BY FOLLOWING A STRING LINE WHICH IS SET FROM THE ALIGNMENT STAKES. THIS MEANS OF CONTROL SHALL BE PLACED AT EACH OUTER EDGE OF THE PAVEMENT SO THAT THE SPREADER IS DIRECTED AT ALL TIMES BY THE ALIGNMENT STAKES AND NOT BY THE EDGE OF THE PRECEDING COURSE EXCEPT FOR THE TRAILING PAVER WHEN PAVERS ARE OPERATED IN ECHELON.

117. THE AUTOMATIC SCREED CONTROLS AND ALL COMPACTION AIDS ON THE PAVER SHALL BE IN OPERATION WHILE THE MIXTURE IS BEING PLACED.

118. SINGLE PAVERS, OR THE LEAD PAVER WHEN PAVERS ARE OPERATED IN ECHELON, SHALL BE CONTROLLED AS TO LONGITUDINAL GRADE BY A 12M SKI OR FLOATING BEAM.

119. THE PAVERS SHALL OPERATE CONTINUOUSLY AT A UNIFORM SPEED NECESSARY TO MATCH THE OUTPUT OF THE PLANT; HOWEVER, IN NO CASE SHALL THE SPEED OF THE PAVER EXCEED 18 M/MIN.

120. IF THE MIXTURE FOR SURFACE COURSE PAVING COME FROM MORE THAN ONE MIXING PLANT, THE MIXTURE FROM EACH PLANT SHALL BE PLACED BY A SEPARATE PAVER.

121. AT JUNCTIONS, TURN–OUTS, DRIVEWAYS, AND OTHER IRREGULAR SECTIONS WHERE IT IS IMPRACTICAL TO SPREAD AND FINISH THE BINDER, LEVELLING OR SURFACE MIXTURES BY MACHINE METHODS, THE CONTRACTOR SHALL USE OTHER SPREADING EQUIPMENT OR SHALL SPREAD THE MIXTURE BY HAND.

122. WHEN LAYING SURFACE COURSES, THE USE OF FEED AUGERS FOR PLACING MIX IN THESE AREAS, ETC. IS PERMITTED ONLY WHEN SUPPLYING MATERIALS TO A HYDRAULIC STRIKE–OFF DEVICE.

123. WHEN IT IS NECESSARY TO HAND–SPREAD THE MIXTURE IN SECTIONS ADJACENT TO MACHINE–LAID AREAS, SUCH HAND–SPREADING SHALL BE CARRIED OUT CONCURRENT WITH MACHINE–LAYING.

124. ALL JOINTS SHALL BE MADE TO ENSURE A THOROUGH AND CONTINUOUS BOND AND TO PROVIDE A SMOOTH RIDING SURFACE.

125. ALL DIRT OR OTHER FOREIGN MATERIAL AND ALL LOOSE MATERIAL SHALL BE REMOVED FROM ALL FACES AT WHICH JOINTS ARE MADE.

126. WHEN MATCHING A COMPACTED JOINT, THE DEPTH OF THE UNCOMPACTED MAT SHALL BE SET TO ALLOW FOR COMPACTION AND THE PAVER SCREED SHALL OVERLAP THE ADJOINING MAT BY AT LEAST 2".

127 ALL FACES AT WHICH JOINTS ARE MADE SHALL BE PAINTED WITH A THIN UNIFORM AND CONTINUOUS COATING OF JOINT PAINTING MATERIAL.

128. LONGITUDINAL JOINTS SHALL BE PROPERLY SET UP WITH THE BACK OF A RAKE OR LUTE, OR BOTH, AT PROPER HEIGHT AND GRADE PRIOR TO ROLLING.

129. LONGITUDINAL BUTT JOINTS BETWEEN THE BINDER COURSE OF THE BITUMINOUS PAVEMENT LAID UNDER THIS CONTRACT AND EXISTING BITUMINOUS PAVEMENT SHALL BE CONSTRUCTED BY TRIMMING THE EXISTING PAVEMENT EDGE TO A STRAIGHT, CLEAN, VERTICAL FACE.

SANITARY FORCEMAIN AND RECLAIM WATER PIPING

130. HDPE PIPE AND FITTINGS SHALL CONFORM TO AWWA C901 OR C906 FOR THE SIZE AND PRESSURE CLASS AS LISTED ON THE PLANS (DR 11). ABOVE GRADE FORCEMAIN SHALL BE UV RESISTANT HDPE DR 11 PIPE.

131. STANDARD HDPE FITTINGS SHALL BE STANDARD COMMERCIAL PRODUCTS MANUFACTURED BY INJECTION MOLDING OR BY EXTRUSION AND MACHINING, OR, SHALL BE FABRICATED FROM PE PIPE CONFORMING TO THIS SPECIFICATION. THE FITTINGS SHALL BE FULLY PRESSURE RATED BY THE MANUFACTURER TO PROVIDE A WORKING PRESSURE EQUAL TO THE PIPE FOR 50 YEARS SERVICE AT 73.4 DEGREES FAHRENHEIT WITH AN INCLUDED 2:1 SAFETY FACTOR. THE FITTINGS SHALL BE MANUFACTURED FROM THE SAME RESIN TYPE, GRADE, AND CELL CLASSIFICATION AS THE PIPE ITSELF. THE MANUFACTURE OF THE FITTINGS SHALL BE IN ACCORDANCE WITH GOOD COMMERCIAL PRACTICE TO PROVIDE FITTINGS HOMOGENOUS THROUGHOUT AND FREE FROM CRACK, HOLES, FOREIGN INCLUSIONS, VOIDS, OR OTHER INJURIOUS DEFECTS. THE FITTINGS SHALL BE AS UNIFORM AS COMMERCIALLY PRACTICABLE IN COLOR, OPACITY, DENSITY, AND OTHER PHYSICAL PROPERTIES. THE MINIMUM "QUICK–BURST" STRENGTH OF THE FITTINGS SHALL NOT BE LESS THAN THAT OF THE PIPE WITH WHICH THE FITTING IS TO BE USED. ALL SERVICE CONNECTIONS TO HDPE MAIN SHALL BE WITH ELECTROFUSION SADDLE WITH GASKETED OUTLET.

132. CONCRETE THRUST BLOCKS MUST BE USED AT ALL BENDS AS DETAILED IN THE PLANS.

133. FORCEMAINS SHALL BE SUBJECTED TO A PRESSURE TEST PRIOR TO ACCEPTANCE. TESTING SHALL BE FOR A 2 HOUR DURATION WITH VALVES CLOSED.

THE CONTRACTOR SHALL FURNISH THE PUMP, PIPE CONNECTIONS, TEMPORARY PLUGS, GAUGES, AND MEASURING EQUIPMENT, AND SHALL PERFORM THE TESTING IN THE PRESENCE OF THE ENGINEER. WHERE PERMANENT AIR VENTS ARE NOT PROVIDED, THE CONTRACTOR SHALL PROVIDE AND INSTALL CORPORATION COCKS AT THE HIGH POINTS AS NEEDED FOR RELEASE OF AIR AS THE LINE IS FILLED WITH WATER.

WHERE CONCRETE REACTION BLOCKING IS PLACED, THE FORCEMAIN SHALL NOT BE SUBJECTED TO HYDROSTATIC PRESSURE UNTIL AT LEAST 5 DAYS HAVE ELAPSED AFTER THE CONCRETE PLACEMENT, WITH THE EXCEPTION THAT THIS PERIOD MAY BE REDUCED TO 2 DAYS WHERE HIGH EARLY STRENGTH CONCRETE IS USED.

ANY DEFECTIVE JOINTS, PIPE, FITTINGS OR VALVES REVEALED DURING THE TESTING OR BEFORE FINAL ACCEPTANCE OF THE WORK SHALL BE SATISFACTORILY CORRECTED AND THE TEST REPEATED UNTIL THE SPECIFIED REQUIREMENTS HAVE BEEN MET.

PRESSURE TEST: THE SECTION BEING TESTED SHALL BE SLOWLY FILLED WITH WATER AND THE SPECIFIED TEST PRESSURE SHALL BE APPLIED AFTER ALL AIR HAS BEEN EXPELLED FROM THE PIPE. A HYDROSTATIC PRESSURE OF TWO TIMES THE MAXIMUM DESIGN PRESSURE, OR A MINIMUM OF 70 POUNDS PER SQUARE INCH GAUGE PRESSURE, MEASURED AT THE LOWEST POINT OF ELEVATION, SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE IN A SATISFACTORY MANNER.

THE GAUGE PRESSURE SHALL BE CHECKED AFTER A MINIMUM OF TWO HOURS. A PRESSURE DROP OF 1 PSI OR LESS OVER A 2–HOUR PERIOD SHALL BE CONSIDERED ACCEPTANCE FOR THE TEST SECTION. IF THE PRESSURE DROP IS GREATER THAN 1 PSI THE CONTRACTOR SHALL INVESTIGATE THE CAUSE AND TAKE CORRECTIVE ACTION. THE CONTRACTOR MUST MAKE EVERY EFFORT TO EXPEL ALL AIR IN THE TEST SECTION, WHICH MAY BE CAUSING A TEST FAILURE. THIS MAY REQUIRE THE CONTRACTOR TO TAP A CORPORATION AT A HIGH POINT OF THE MAIN ON THE TOP OF THE PIPE TO RELEASE TRAPPED AIR. ONLY IF SEVERAL CONSECUTIVE TESTS INDICATE A CONSISTENT PRESSURE DROP AND ONLY AFTER THE CONTRACTOR HAS MADE NUMEROUS ATTEMPTS TO RESOLVE THE PROBLEM, ACCEPTABLE TO THE ENGINEER, MAY THE ENGINEER CONSIDER THE USE OF THE LEAKAGE TEST AS ACCEPTANCE. THE LEAKAGE TEST MAY BE PERFORMED BY THE CONTRACTOR TO DETERMINE THE MAGNITUDE OF THE LEAK; HOWEVER, MEETING THE LEAKAGE ALLOWANCE SHALL NOT AUTOMATICALLY BE CONSIDERED ACCEPTANCE, IN LIEU OF THE PRESSURE TEST, FOR THE SECTION BEING TESTED.

LEAKAGE TEST: AFTER AN UNSATISFACTORY PRESSURE TEST, AND IF AUTHORIZED IN WRITING BY THE ENGINEER, A LEAKAGE TEST SHALL BE PERFORMED ON EACH VALVED SECTION OF FORCEMAIN TO DETERMINE THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE SECTION TO MAINTAIN A TEST PRESSURE OF 70 POUNDS PER SQUARE INCH, AFTER THE AIR IN THE PIPELINE HAS BEEN EXPELLED AND THE PIPE HAS BEEN FILLED WITH WATER. THE WATER ADDED SHALL BE RECORDED TO THE NEAREST FLUID OUNCE.

AFTER FILLING THE PIPE WITH WATER AND EXPELLING ALL AIR IN THE LINE, A PRESSURE OF 2 TIMES THE MAXIMUM DESIGN PRESSURE OR A MINIMUM OF 70 PSIG MEASURED AT THE LOWEST POINT OF ELEVATION SHALL BE APPLIED IN THE SAME MANNER AS PRESCRIBED FOR THE SECTION TO MAINTAIN THE PRESSURE FOR A TEST DURATION OF 2 HOURS.

EACH PIPE SECTION TESTED WILL BE ACCEPTED IF THE LEAKAGE DOES NOT EXCEED THE QUANTITY DETERMINED BY THE FORMULA AS SHOWN IN THE TABLE.

$$L = \frac{SD*(P\hat{\ }0.50)}{133{,}200}$$

L = MAXIMUM PERMISSIBLE LEAKAGE IN GALLONS PER HOUR
S = LENGTH OF PIPE TESTED
D = NOMINAL DIAMETER OF PIPE IN INCHES
P = AVERAGE TEST PRESSURE DURING THE TEST, IN POUNDS PER SQUARE INCH, GAUGE PRESSURE

ALLOWABLE LEAKAGE PER 1000 FEET OF PIPE
GALLONS PER HOUR

AVG. TEST PRESSURE PSI	NOMINAL PIPE DIAMETER – INCHES 4	6	8	10	12
200	0.43	0.64	0.85	1.06	1.28
175	0.40	0.59	0.80	0.99	1.19
150	0.37	0.55	0.74	0.92	1.10
125	0.34	0.50	0.67	0.84	1.01
100	0.30	0.45	0.60	0.75	0.90
75	0.25	0.38	0.50	0.63	0.75

IF THE PIPE SECTION UNDER TEST CONTAINS PIPE OF VARIOUS DIAMETERS, THE ALLOWABLE LEAKAGE WILL BE THE SUM OF THE COMPUTED LEAKAGE FOR EACH SIZE

WHEN REQUESTED, THE CONTRACTOR SHALL FURNISH A WRITTEN REPORT OF THE RESULTS OF LEAKAGE TESTS, WHICH SHALL IDENTIFY THE SPECIFIC TEST SECTION, THE AVERAGE PRESSURE, THE DURATION OF TEST, AND THE AMOUNT OF LEAKAGE.

GRAVITY SANITARY SEWER (NON–PRESSURE)

134. SANITARY SEWER GRAVITY PIPE, FITTINGS, AND SERVICES SHALL BY POLYVINYL CHLORIDE (PVC). NON–PRESSURE PIPE SHALL CONFORM TO THE REQUIREMENTS OF ASTM D1784 AND D3034, WITH SDR OF 35, OR ASTM F789 AND D3034, AND SHALL HAVE PUSH–ON JOINTS WITH ELASTOMERIC GASKETS.

135. THE PRIMARY LINE AND GRADE WILL BE ESTABLISHED FROM THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SETTING LINE AND GRADE STAKES PARALLEL TO THE PROPOSED PIPELINE AT AN APPROPRIATE OFFSET AND INTERVAL AS WILL SERVE THE CONTRACTORS OPERATIONS WHEREVER PRACTICAL, AT EACH CHANGE IN LINE OR GRADE, AND AS NEEDED FOR PIPELINE APPURTENANCES AND SERVICE LINES.

136. THE CONTRACTOR SHALL ARRANGE HIS OPERATIONS TO AVOID UNNECESSARY INTERFERENCE WITH THE ESTABLISHED PRIMARY LINE AND GRADE STAKES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRESERVATION OF THE PRIMARY STAKES AND SHALL RESTAKE AS NECESSARY.

137. NO DEVIATION SHALL BE MADE FROM THE REQUIRED LINE OR GRADE WITHOUT THE CONSENT OF THE ENGINEER.

138. IN AREAS OF CONFLICT BETWEEN WATERMAINS, HOUSE SEWERS, STORM SEWERS, A SEPARATION OF AT LEAST 12 INCHES BETWEEN THE WATERMAIN AND SEWER SHALL BE PROVIDED. WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION AS DESCRIBED, THE FOLLOWING CONSTRUCTION SHALL BE USED:

1) SEWERS PASSING OVER OR UNDER WATER MAINS SHALL BE CONSTRUCTED OF MATERIALS EQUAL TO WATER MAIN STANDARDS OF CONSTRUCTION FOR A DISTANCE OF AT LEAST 9 FEET ON EITHER SIDE OF THE WATER MAIN.

2) WATER MAIN PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:

A) ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING ON AND BREAKING OF THE WATER MAINS; AND

B) THAT THE LENGTH OF WATER PIPE BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

WATER MAINS SHALL BE LAID AT LEAST 10 FEET HORIZONTALLY FROM ANY SANITARY SEWER, STORM SEWER OR SEWER MANHOLE, WHENEVER POSSIBLE. WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF 10 FEET A WATER MAIN MAY BE LAID CLOSER TO A STORM OR SANITARY SEWER PROVIDED THAT:

1) THE BOTTOM OF THE WATER MAIN IS AT LEAST 12 INCHES ABOVE THE TOP OF THE SEWER;

2) WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF MATERIALS WITH JOINTS THAT ARE EQUIVALENT TO WATER MAIN STANDARDS OF CONSTRUCTION AND SHALL BE PRESSURE TESTED TO ASSURE WATER TIGHTNESS PRIOR TO BACKFILLING.

139. EXCAVATING OPERATIONS SHALL PROCEED ONLY SO FAR IN ADVANCE OF PIPE LAYING AS WILL SATISFY THE NEEDS FOR COORDINATION OF WORK AND PERMIT ADVANCE VERIFICATION OF UNOBSTRUCTED LINE AND GRADE AS PLANNED. WHERE INTERFERENCE WITH EXISTING STRUCTURES IS POSSIBLE OR IN ANY WAY INDICATED, AND WHERE NECESSARY TO ESTABLISH ELEVATION OR DIRECTION FOR CONNECTIONS TO INPLACE STRUCTURES, THE EXCAVATING SHALL BE DONE AT THOSE LOCATIONS IN ADVANCE OF THE MAIN OPERATION SO ACTUAL CONDITIONS WILL BE EXPOSED IN SUFFICIENT TIME TO MAKE ADJUSTMENTS WITHOUT RESORTING TO EXTRA WORK OR UNNECESSARY DELAY.

140. ALL INSTALLATIONS SHALL BE ACCOMPLISHED BY OPEN TRENCH CONSTRUCTION EXCEPT WHERE BORING AND JACKING OR TUNNEL CONSTRUCTION METHODS SHALL BE EMPLOYED AS SPECIFICALLY REQUIRED BY THE PLANS OR APPROVED BY THE ENGINEER. SURFACE STRUCTURES MUST BE PROPERLY SUPPORTED AND THE BACKFILL RESTORED TO THE SATISFACTION OF THE ENGINEER.

141. THE EXCAVATION OPERATIONS SHALL BE CONDUCTED TO CAREFULLY EXPOSE ALL INPLACE UNDERGROUND STRUCTURES WITHOUT DAMAGE. WHEREVER THE EXCAVATION EXTENDS UNDER OR APPROACHES CLOSE TO AN EXISTING STRUCTURE AS TO ENDANGER IT IN ANY WAY, PRECAUTIONS AND PROTECTIVE MEASURES SHALL BE TAKEN AS NECESSARY TO PRESERVE THE STRUCTURE AND PROVIDE TEMPORARY SUPPORT. HAND METHODS OF EXCAVATING SHALL BE UTILIZED TO PROBE FOR AND EXPOSE SUCH CRITICAL OR HAZARDOUS INSTALLATIONS AS GAS PIPE AND POWER OR TELEPHONE CABLES.

142. TRENCH EXCAVATING SHALL BE TO A DEPTH THAT WILL PERMIT PREPARATION OF FOUNDATION, AS SPECIFIED, AND INSTALLATION OF THE PIPELINE AND APPURTENANCES AT THE PRESCRIBED LINE AND GRADE EXCEPT WHERE ALTERATIONS AND SPECIFICALLY AUTHORIZED. TRENCH WIDTHS SHALL BE SUFFICIENT TO PERMIT THE PIPE TO BE LAID AND JOINED PROPERLY AND THE BACKFILL TO BE PLACED AND COMPACTED AS SPECIFIED. EXTRA WIDTH SHALL BE PROVIDED AS NECESSARY TO PERMIT CONVENIENT PLACEMENT OF SHEETING AND SHORING AND TO ACCOMMODATE PLACEMENT OF APPURTENANCES.

143. EXCAVATIONS SHALL BE EXTENDED BELOW THE BOTTOM OF STRUCTURE GRADE, AS NECESSARY TO ACCOMMODATE ANY REQUIRED GRANULAR BEDDING MATERIAL. WHEN UNSTABLE FOUNDATION MATERIALS ARE ENCOUNTERED AT THE ESTABLISH GRADE, ADDITIONAL MATERIALS SHALL BE REMOVED AS SPECIFIED OR ORDERED BY THE ENGINEER TO PRODUCE AN ACCEPTABLE FOUNDATION. ALL EXCAVATIONS BELOW GRADE SHALL BE TO A MINIMUM WIDTH EQUAL TO THE OUTSIDE PIPE DIAMETER PLUS 2 FEET.

144. TRENCH WIDTHS SHALL ALLOW FOR AT LEAST SIX INCHES OF CLEARANCE ON EACH SIDE OF THE JOINT HUBS. THE MAXIMUM ALLOWABLE WIDTH OF THE TRENCH AT THE TOP OF PIPE LEVEL SHALL BE THE OUTSIDE DIAMETER OF THE PIPE PLUS TWO FEET. THE WIDTH OF THE TRENCH AT THE GROUND SURFACE SHALL BE HELD TO A MINIMUM TO PREVENT UNNECESSARY DESTRUCTION OF THE SURFACE STRUCTURES WHILE MAINTAINING SAFE WORKING CONDITIONS.

145. THE MAXIMUM ALLOWABLE TRENCH WIDTH AT THE LEVEL OF THE TOP OF PIPE MAY BE EXCEEDED ONLY BY APPROVAL OF THE ENGINEER, AFTER HIS CONSIDERATION OF PIPE STRENGTH AND LOADING RELATIONSHIPS. ANY ALTERNATE PROPOSALS MADE BY THE CONTRACTOR SHALL BE IN WRITING, GIVE THE PERTINENT SOIL WEIGHT DATA AND PROPOSED PIPE STRENGTH ALTERNATE, AND SHALL BE MADE IN A TIMELY MANNER SO AS NOT TO DELAY THE PROJECT. APPROVAL OF ALTERNATE PIPE DESIGNS SHALL BE WITH THE UNDERSTANDING THAT NO EXTRA COMPENSATION WILL BE ALLOWED FOR ANY INCREASE IN MATERIAL OR CONSTRUCTION COSTS.

146. FOUNDATION PREPARATIONS SHALL BE CONDUCTED TO PRODUCE A STABLE FOUNDATION AND PROVIDE CONTINUOUS AND UNIFORM PIPE BEARING BETWEEN BELL HOLES.

147. IN EXCAVATIONS MADE BELOW GRADE TO REMOVE UNSUITABLE MATERIALS, THE BACKFILLING TO GRADE SHALL BE MADE WITH GRANULAR MATERIAL. PLACEMENT OF THE BACKFILL SHALL BE IN RELATIVELY UNIFORM LAYERS NOT EXCEEDING 8 INCHES IN LOOSE THICKNESS. EACH LAYER OF BACKFILL SHALL BE COMPACTED THOROUGHLY, BY MEANS OF APPROVED MECHANICAL COMPACTION EQUIPMENT, TO PRODUCE UNIFORM PIPE SUPPORT THROUGHOUT THE FULL PIPE LENGTH AND FACILITATE PROPER SHAPING OF THE PIPE BED.

148. CARE SHALL BE TAKEN DURING FINAL SUBGRADE SHAPING TO PREVENT ANY OVER–EXCAVATION. SHOULD ANY LOW SPOTS DEVELOP, THEY SHALL ONLY BE FILLED WITH GRANULAR MATERIAL, WHICH SHALL BE COMPACTED THOROUGHLY. THE FINISHED SUBGRADE SHALL NOT BE DISTURBED DURING PIPE LOWERING OPERATIONS EXCEPT AS NECESSARY TO REMOVE PIPE SLINGS. THE DISCHARGE OF TRENCH DEWATERING PUMPS SHALL BE DIRECTED TO NATURAL DRAINAGE CHANNELS OR STORM DRAINS IN A MANNER WHICH DOES NOT CAUSE DAMAGE TO PRIVATE OR PUBLIC PROPERTY. ANY DEBRIS LEFT BY DEWATERING OPERATION SHALL BE CLEANED UP IMMEDIATELY BY THE CONTRACTOR. DRAINING TRENCH WATER INTO SANITARY SEWERS OR COMBINED SEWERS WILL NOT BE PERMITTED.

149. THE CONTRACTOR SHALL INSTALL AND OPERATE A DEWATERING SYSTEM TO MAINTAIN PIPE TRENCHES FREE OF WATER WHENEVER NECESSARY OR AS DIRECTED BY THE ENGINEER TO MEET THE INTENT OF THESE SPECIFICATIONS.

150. INSPECTION, HANDLING, AND ALL ASPECTS OF THE INSTALLATION OF THE PIPE, SERVICES, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, AND AS SUPPLEMENTED AS FOLLOWS:

A) INSPECTION AND HANDLING: PROPER AND ADEQUATE IMPLEMENTS, TOOLS, AND FACILITIES HALL BE PROVIDED AND USED THE CONTRACTOR FOR THE SAFE AND CONVENIENT PROSECUTION OF THE WORK. UNLOADING, DISTRIBUTION, AND STORAGE OF PIPE AND APPURTENANT MATERIALS ON THE JOB SITE SHALL BE AT A LOCATION APPROVED BY THE ENGINEER. ALL MATERIALS SHALL BE HANDLED CAREFULLY, AS WILL PREVENT DAMAGE TO PROTECTIVE COATINGS, LININGS, AND JOINT FITTINGS; PRECLUDE CONTAMINATION OF INTERIOR AREAS; AND TO AVOID JOLTING CONTACT, DROPPING OR DUMPING.

BEFORE BEING LOWERED INTO LAYING POSITION, THE CONTRACTOR SHALL MAKE A THOROUGH VISUAL INSPECTION OF EACH PIPE SECTION AND APPURTENANT UNITS TO DETECT DAMAGE OR UNSOUND CONDITIONS THAT MAY NEED CORRECTIVE ACTION OR BE CAUSE FOR REJECTION. INSPECTION PROCEDURE SHALL BE AS APPROVED BY THE ENGINEER, WITH SPECIAL METHODS BEING REQUIRED, AS HE DEEMS NECESSARY TO CHECK OUT SUSPECTED DEFECTS MORE DEFINITELY. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY DEFECTS DISCOVERED AND THE ENGINEER WILL PRESCRIBE THE REQUIRED CORRECTIVE ACTION OR ORDER REJECTION.

DATE	NO:	REVISION
SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
PROJECT SPECIFICATIONS

SCALE: AS SHOWN | JOB NO: 20-089
DRAWN BY: JP | DRAWING #: SP1.1
DATE: JAN 2021

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (1/4"=1'-0" ON 24x36 SHEET = 1/8"=1'-0" ON 11x17 SHEET)

IMMEDIATELY BEFORE PLACEMENT, THE JOINT SURFACES OF EACH PIPE SECTION AND FITTING SHALL BE INSPECTED FOR THE PRESENCE OF FOREIGN MATTER, COATING BLISTERS, ROUGH EDGES OR PROJECTIONS, AND ANY IMPERFECTIONS SO DETECTED SHALL BE CORRECTED BY CLEANING, TRIMMING, OR REPAIRS AS NEEDED.

B) PIPE LAYING OPERATIONS: TRENCH EXCAVATION AND BEDDING PREPARATIONS SHALL PROCEED AHEAD OF PIPE PLACEMENT AS WILL PERMIT PROPER LAYING AND JOINING OF THE UNITS AT THE PRESCRIBED GRADE AND ALIGNMENT WITHOUT UNNECESSARY DEVIATION OR HINDRANCE.

ALL FOREIGN MATTER OR DIRT SHALL BE REMOVED FROM THE INSIDE OF THE PIPE AND FITTINGS BEFORE THEY ARE LOWERED INTO POSITION IN THE TRENCH AND THEY SHALL BE KEPT CLEAN BY APPROVED MEANS DURING AND AFTER LAYING. THE SEWER MATERIALS SHALL BE CAREFULLY LOWERED INTO LAYING POSITION BY THE USE OF SUITABLE RESTRAINING DEVICES. UNDER NO CIRCUMSTANCES SHALL THE PIPE BE DROPPED INTO THE TRENCH.

AT THE TIME OF PIPE PLACEMENT, THE BEDDING CONDITIONS SHALL BE SUCH AS TO PROVIDE UNIFORM AND CONTINUOUS SUPPORT FOR THE PIPE BETWEEN BELL HOLES. BELL HOLES SHALL BE EXCAVATED AS NECESSARY TO MAKE THE JOINT CONNECTIONS, BUT THEY SHALL BE NO LARGER THAN WOULD BE ADEQUATE TO SUPPORT THE PIPE THROUGHOUT ITS LENGTH. NO PIPE MATERIAL SHALL BE LAID IN WATER OR WHEN THE TRENCH OR BEDDING CONDITIONS ARE OTHERWISE UNSUITABLE OR IMPROPER.

WHEN PLACEMENT OR HANDLING PRECAUTIONS PROVE INADEQUATE, IN THE ENGINEER'S OPINION, THE CONTRACTOR SHALL PROVIDE AND INSTALL SUITABLE PLUGS OR CAPS EFFECTIVELY CLOSING THE OPEN ENDS OF EACH PIPE SECTION BEFORE IT IS LOWERED INTO THE LAYING POSITION, AND THEY SHALL REMAIN SO COVERED UNTIL REMOVAL IS NECESSARY FOR CONNECTION OF AN ADJOINING UNIT.

UNLESS OTHERWISE PERMITTED BY THE ENGINEER, BELL AND SPIGOT PIPE SHALL BE LAID WITH THE BELL ENDS FACING UPGRADE AND THE LAYING SHALL START ON THE DOWNGRADE END AND PROCEED UPGRADE. AS EACH LENGTH OF BELL AND SPIGOT PIPE IS PLACED IN LAYING POSITION, THE SPIGOT END SHALL BE CENTERED IN THE BELL AND THE PIPE FORCED HOME AND BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH APPROVED BACKFILL MATERIAL, WHICH SHALL BE THOROUGHLY COMPACTED BY TAMPING AROUND THE PIPE OUT TO THE TRENCH WALL.

CONNECTION OF PIPE TO EXISTING LINES OR PREVIOUSLY CONSTRUCTED MANHOLES SHALL BE ACCOMPLISHED AS SHOWN IN THE PLANS OR AS OTHERWISE APPROVED BY THE ENGINEER. ALL STRUCTURE PENETRATIONS SHALL BE MADE WITH THE USE OF WATERSTOP SEALS.

AT ALL TIMES WHEN PIPE LAYING IS NOT IN PROGRESS, INCLUDING NOON HOUR AND OVERNIGHT PERIODS, ALL OPEN ENDS OF THE PIPE LINE SHALL BE CLOSED BY WATERTIGHT PLUGS OR OTHER MEANS APPROVED BY THE ENGINEER. IF WATER IS PRESENT IN THE TRENCH, THE SEALS SHALL REMAIN IN PLACE UNTIL THE TRENCH IS PUMP COMPLETELY DRY.

INSTALLATION OF PVC SHALL CONFORM TO ASTM D 2321.

151. CONNECTION AND ASSEMBLY OF JOINTS: ALL PIPE AND FITTING JOINTS SHALL FIT TIGHTLY AND BE FULLY CLOSED. SPIGOT ENDS SHALL BE MARKED AS NECESSARY TO INDICATE THE POINT OF COMPLETE CLOSURE ON PVC PIPE. ALL JOINTS SHALL BE WATERTIGHT.

ALL PIPE AND FITTING ENDS LEFT OPEN FOR FUTURE CONNECTION SHALL BE CLOSED OFF WITH PREFABRICATED PLUGS OR CAPS.

PREFABRICATED PLUGS AND CAPS SHALL BE OF THE SAME MATERIAL AS THE PIPE MATERIAL, OR AN APPROVED ALTERNATE MATERIAL, AND SHALL BE WATERTIGHT.

SANITARY SEWER LINES CONNECTING INTO AN EXISTING MANHOLE, UNLESS SPECIFIED OTHERWISE, SHALL BE MADE BY INSTALLING THE PIPE AT OR SLIGHTLY ABOVE THE ELEVATION OF THE BENCH. A CONCRETE INVERT ONE HALF THE DEPTH OF THE SEWER PIPE SHALL BE FORMED ON THE BENCH FROM THE SEWER PIPE TO THE EDGE OF THE EXISTING INVERT THROUGH THE MANHOLE.

CONCRETE MANHOLE ADAPTERS, WATERSTOP SEALS, SHALL BE USED TO PROVIDE A WATERTIGHT SEAL WHEN PENETRATING A STRUCTURE WALL WITH A PIPE.

IF SPECIFIED, SANITARY SEWER LINE CONNECTION INTO AN EXISTING MANHOLE SHALL BE MADE BY REMOVING A PORTION OF THE EXISTING MANHOLE INVERT AND RECONSTRUCTING TO PROVIDE SMOOTH FLOW OF ALL PIPELINES THROUGH THE MANHOLE.

152. GRAVITY SEWER SERVICE CONNECTIONS AND SERVICE SEWER PIPE SHALL BE INSTALLED WHERE INDICATED ON THE PLANS, AND /OR WHERE STAKED IN THE FIELD. THE SEWER SERVICE CONNECTIONS AND PIPE LINES SHALL BE INSTALLED IN CONFORMANCE WITH ALL APPLICABLE REQUIREMENTS OF THE GRAVITY SEWER INSTALLATION AND AS MORE SPECIFICALLY PROVIDED FOR HEREIN.

THE CONTRACTOR SHALL KEEP ACCURATE RECORDS OF ALL SERVICE INSTALLATIONS AS TO TYPE, SIZE, LOCATION, ELEVATION, POINT OF CONNECTION AND TERMINATION, ETC. THIS SERVICE RECORD SHALL BE MAINTAINED BY THE CONTRACTOR. THE SERVICE INSTALLATIONS SHALL NOT BE BACKFILLED UNTIL VISUALLY INSPECTED AND ALL REQUIRED INFORMATION HAS BEEN OBTAINED AND RECORDED.

THE MAIN SEWER SERVICE CONNECTION SHALL CONSIST OF INSTALLING A BUILT-IN WYE FITTING IN THE GRAVITY SEWER LINE AT DESIGNATED LOCATIONS OR OF PROVIDING AN INSERT TYPE WYE SADDLE WITH GASKETED SKIRT WITH 2 STAINLESS STEEL STRAPS IN A PIPE CUT-OUT WHERE THE GRAVITY MAIN IS EXISTING. ORIENTATION OF SERVICE CONNECTION FITTING IS SHOWN IN THE DETAIL PLATES.

WHERE THE DEPTH OF THE GRAVITY SEWER INVERT IS 15 FEET OR GREATER, THE SERVICE CONNECTION SHALL BE EXTENDED UPWARD BY MEANS OF A SERVICE RISER PIPE IN ACCORDANCE WITH THE DETAIL PLATE.

UNLESS OTHERWISE SPECIFIED, SERVICE PIPE SHALL BE INSTALLED AT RIGHT ANGLES TO THE MAIN SEWER AND AT A STRAIGHT-LINE GRADE TO THE PROPERTY LINE. TYPICAL PIPE GRADE IS 2.00% (1/4 INCH PER FOOT) FOR GRAVITY SERVICES, HOWEVER, 1.00% (1/8 INCH PER FOOT) MAY BE ALLOWED IN RESTRICTIVE ELEVATION DIFFERENCES WHEN APPROVED BY THE ENGINEER.

SERVICE TRENCHES SHALL BE RESTORED AND COMPACTED AS SPECIFIED FOR PIPELINES.

UNLESS OTHERWISE INDICATED, SERVICE PIPE INSTALLATION SHALL TERMINATE AT THE PROPERTY LINE, AT WHICH POINT THE CONTRACTOR SHALL INSTALL A PREFABRICATED PLUG OR CAP, SECURED TO PASS THE AIR TEST, SET A 2 X 4 INCH WOODED STAKE FROM THE PLUG UP TO GRADE TO MARK THE EXACT END OF PIPE, AND A SURFACE MARKER OF A METAL FENCE POST WITH THE TOP 2 FEET PAINTED ORANGE SHALL ALSO BE PROVIDED.

SEWER SERVICE LINES SHALL NOT BE CONNECTED INTO MANHOLES WITHOUT THE APPROVAL OF THE ENGINEER; RATHER, WYES SHALL BE PLACED IN THE MAIN LINE PRIOR TO THE MANHOLE. WHEN SEWER SERVICES MUST BE RUN INTO A MANHOLE THE CONNECTION SHALL BE THROUGH THE MANHOLE WALL WITH A WATERTIGHT SEALING BOOT OR APPROVED WATERSTOP GASKET. A CONCRETE CHANNEL, ½ THE DEPTH OF THE SERVICE PIPE DIAMETER, SHALL BE FORMED ON THE MANHOLE BENCH TO DIRECT THE FLOW. THIS CHANNEL SHALL EXTEND FROM THE END OF THE SERVICE PIPE TO THE EDGE OF THE INVERT CHANNEL RUNNING THROUGH THE MANHOLE BASE.

ALL PIPE AND FITTING STUBS SHALL BE SEALED WITH PREFABRICATED PLUGS OR CAPS AND SECURED TO PAST THE AIR TEST. THEIR LOCATIONS SHALL BE MARKED IN THE SAME MANNER AS NOTED ABOVE FOR SERVICE TERMINATIONS.

153. DEFLECTION TESTING SHALL BE PERFORMED ON ALL FLEXIBLE PIPE (PVC) INSTALLED FOR GRAVITY SEWER. THE TEST SHALL BE CONDUCTED AFTER THE FINAL BACKFILL HAS BEEN IN PLACE FOR AT LEAST 30 DAYS. IF DEWATERING WAS NECESSARY FOR CONSTRUCTION IT SHALL BE REMOVED PRIOR TO THE DEFLECTION TESTING. THE CONTRACTOR MAY PERFORM A DEFLECTION TEST PRIOR TO REMOVING THE DEWATERING TO CHECK HIS WORK. HOWEVER, THE FINAL ACCEPTANCE DEFLECTION TEST MUST BE MADE WITHOUT DEWATERING OCCURRING AND AFTER THE 30-DAY WAITING PERIOD.

THE CONTRACTOR SHALL PREPARE THE PIPE FOR DEFLECTION TESTING, CLEANING AND STRINGING THE LINES, PRIOR TO REQUESTING THE PRESENCE OF THE ENGINEER TO OBSERVE THE TESTS.

THE DEFLECTION TEST SHALL BE PERFORMED USING A RIGID MANDREL WITH A DIAMETER EQUAL TO 95% OF THE INSIDE DIAMETER OF THE PIPE CONSIDERING MANUFACTURING ALLOWANCES. THE MANDREL DIAMETER, AS LISTED IN THE TABLE BELOW, MUST BE CLEARLY STAMPED ON IT OR THE MANDREL SHALL BE CONSIDERED UNACCEPTABLE. THE TEST SHALL BE PERFORMED WITHOUT ANY MECHANICAL DEVICES. ANY PIPE EXCEEDING 5% DEFLECTION SHALL BE CORRECTED OR REMOVED AND REPLACED.

ASTM 3034 NOMINAL PIPE DIAM. INCH	BASE INSIDE DIAM. INCH	MANDREL DIAM. INCH	ASTM F 789 BASE INSIDE DIAM. INCH	MANDREL DIAM. INCH
6	5.742	5.45	–	–
8	7.665	7.28	7.73	7.34
10	9.563	9.08	9.64	9.15
12	11.361	10.79	11.46	10.88
15	13.898	13.20	14.01	13.30

FROM UNIBELL HANDBOOK, TABLE 69 (1982).

154. ALL SANITARY SEWER LINES SHALL BE SUBSTANTIALLY WATERTIGHT AND SHALL BE TESTED FOR EXCESSIVE LEAKAGE UPON COMPLETION AND BEFORE SERVICE CONNECTIONS ARE MADE. EACH TEST SECTION OF THE SEWER SHALL BE SUBJECTED TO EXFILTRATION TESTING, BY AIR TEST METHOD OR WHEN APPROVED BY THE ENGINEER BY HYDROSTATIC METHOD AS DESCRIBED BELOW. THE REQUIREMENTS SET FORTH FOR MAXIMUM LEAKAGE SHALL BE MET AS A CONDITION FOR ACCEPTANCE OF THE SEWER SECTION REPRESENTED BY THE TEST.

IN THE EVENT OF TEST FAILURE ON ANY TEST SECTION, TESTING SHALL BE CONTINUED UNTIL ALL LEAKAGE HAS BEEN DETECTED AND CORRECTED TO MEET THE REQUIREMENTS. ALL REPAIR WORK SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER. INTRODUCTION OF SEALANT SUBSTANCES BY MEANS OF THE TEST WATER WILL NOT BE PERMITTED. UNSATISFACTORY REPAIRS OR TEST RESULTS MAY RESULT IN AN ORDER TO REMOVE AND REPLACE PIPE, AS THE ENGINEER CONSIDERS NECESSARY FOR TEST CONFORMANCE. ALL REPAIR AND REPLACEMENT WORK SHALL BE AT THE CONTRACTOR'S EXPENSE.

A) AIR TEST METHOD: THE SECTION OF SEWER PIPE SHALL BE CLEAN, AND THE PIPE MAY BE WETTED. PNEUMATIC BALLS SHALL BE USED TO PLUG EACH END OF THE TEST SECTION AT A MANHOLE. THE TESTING GAUGE SHALL BE LOCATED AT GROUND LEVEL, OUT OF THE MANHOLE, AND HAVE DIAL INCREMENTS OF 0.1 PSI OR LESS.

LOW-PRESSURE AIR SHALL BE INTRODUCED INTO THE LINE UNTIL THE GAUGE PRESSURE REACHES 4.0 PSIG PLUS THE INCREMENTAL BACK PRESSURE REQUIRED FOR THE AVERAGE HEIGHT OF GROUND WATER ABOVE THE PIPE SHALL BE DETERMINED BY DIVIDING THE AVERAGE HEIGHT BY 2.31. THE FOLLOWING TABLE SUMMARIZES THESE VALUES FOR HEIGHTS OF 1-10 FEET.

AVERAGE HEIGHT OF GROUND WATER TABLE ABOVE PIPE	INCREMENTAL BACKPRESSURE TO BE ADDED TO 4.0 PSIG
1 FOOT	0.43 PSIG
2 FEET	0.86 PSIG
3 FEET	1.29 PSIG
4 FEET	1.72 PSIG
5 FEET	2.16 PSIG
6 FEET	2.59 PSIG
7 FEET	3.01 PSIG
8 FEET	3.44 PSIG
9 FEET	3.87 PSIG
10 FEET	4.30 PSIG

THE SEWER SECTION UNDER TEST WILL BE ACCEPTED AS HAVING PASSED THE AIR LEAKAGE TEST IF IT DOES NOT LOSE AIR AT A RATE TO CAUSE THE PRESSURE TO DROP FROM 3.6 TO 3.0 PSI IN LESS THAN ONE-HALF MINUTE PER INCH IN DIAMETER OF THE PIP TESTED. TESTING MUST BE DONE IN THE PRESENCE OF THE ENGINEER. IF THE TEST FAILS, NECESSARY REPAIRS SHALL BE MADE AND THE TEST PERFORMED AGAIN UNTIL ACCEPTABLE.

B) HYDROSTATIC TEST METHOD: AFTER BULKHEADING THE TEST SECTION, THE PIPE SHALL BE SUBJECTED TO A HYDROSTATIC PRESSURE PRODUCED BY HEAD OF WATER AT A DEPTH OF THREE FEET ABOVE THE INVERT ELEVATION OF THE SEWER AT THE MANHOLE OF THE TEST SECTION. IN AREAS WHERE GROUND WATER EXISTS, THIS HEAD OF WATER SHALL BE THREE FEET ABOVE THE EXISTING WATER TABLE.

THE WATER HEAD SHALL BE MAINTAINED FOR A PERIOD OF ONE HOUR DURING WHICH TIME IT WILL BE PRESUMED THAT FULL ABSORPTION OF THE PIPE BODY HAS TAKEN PLACE, AND THEREAFTER FOR AN EXTENDED PERIOD OF ONE HOUR THE WATER HEAD SHALL BE MAINTAINED AS THE TEST PERIOD. DURING THE ONE HOUR TEST PERIOD, THE MEASURED WATER LOSS WITHIN THE TEST SECTION, INCLUDING SERVICE STUBS, SHALL NOT EXCEED THE MAXIMUM ALLOWABLE VOLUMES GIVEN BELOW FOR THE APPLICABLE MAIN SEWER DIAMETER.

MAIN SEWER DIAMETER (IN INCHES)	MAXIMUM ALLOWABLE LOSS * (IN GALLONS PER HOUR PER 100 FEET)
6	0.5
8	0.6
10	0.8
12	1.0
15	1.2
18	1.4
21	1.7
24 & LARGER	1.9

*BASED ON 100 GALLONS PER DAY PER INCH PER MILE.

IF MEASUREMENT INDICATES EXFILTRATION WITHIN A TEST SECTION IS NOT GREATER THAN THE ALLOWABLE MAXIMUM; THE SECTION WILL BE ACCEPTED AS PASSING THE TEST. TESTING MUST BE DONE IN THE PRESENCE OF THE ENGINEER. IF THE TEST FAILS, NECESSARY REPAIRS SHALL BE MADE AND THE TEST PERFORMED AGAIN UNTIL ACCEPTABLE.

WATERMAIN

155. WATERMAIN PIPE SHALL BE POLYVINYL CHLORIDE PIPE (PVC) AND SHALL CONFORM TO AWWA C900 FOR PIPE 4 INCHES THROUGH 12 INCHES IN DIAMETER. ALL 4 INCH THROUGH 12 INCH PIPE SHALL HAVE A MINIMUM DIMENSION RATIO (DR)OF 18, CORRESPONDING TO A WORKING PRESSURE OF 150 PSI FOR PVC TYPE 1120 PIPE.

156. FITTINGS SHALL BE GRAY IRON OR DUCTILE IRON, HAVING A MINIMUM WORKING PRESSURE RATING OF 150 PSI, AND SHALL CONFORM TO THE REQUIREMENTS OF AWWA C110 (ANSI A21.10), OR AWWA C1153 (ANSI 21.53) DUCTILE-IRON COMPACT FITTINGS.

157. JOINTS IN PLASTIC PIPE SHALL BE BELL-END ELASTOMERIC-GASKET TYPES.

158. FIRE HYDRANTS SHALL MEET THE REQUIREMENTS OF THE BERMUDA FIRE SERVICE (BFS).

159. BUTTERFLY VALVES SHALL CONFORM TO THE REQUIREMENTS OF AWWA C504 AND THE FOLLOWING REQUIREMENTS:

1) WORKING PRESSURE RATING OF 150-PSI MINIMUM.
2) TWO-INCH SQUARE OPERATING NUT OPENING COUNTERCLOCKWISE (LEFT).
3) DOUBLE "O" RING STEM SEAL, OR SPLIT V TYPE STEM SEAL.
4) TRAVELING NUT TYPE OPERATOR PERMANENTLY SEALED AND LUBRICATED.
5) MANUFACTURERS: DRESSER, PRATT, OR EQUAL.

160. GATE VALVES SHALL CONFORM TO AWWA C509 FOR RESILIENT SEATED VALVES, AND SHALL COMPLY WITH THE FOLLOWING SUPPLEMENTARY REQUIREMENTS:

1) WORKING PRESSURE RATING OF 200 PSI FOR ALL SIZES.
2) TWO-INCH SQUARE OPERATING NUT OPENING COUNTERCLOCKWISE (LEFT).
3) DOUBLE "O" RING STEM STEAL, ONE ABOVE AND BELOW THE STEM SEAL.
4) WEATHER SEAL ON BONNET COVER.
5) NON-RISING STEM.
6) MECHANICAL JOINTS FOR TYPICAL INSTALLATION. TAPPING SLEEVE ASSEMBLIES REQUIRE FLANGE BY MECHANICAL JOINT.
7) MANUFACTURERS: AMERICAN, MUELLER, KENNEDY, OR EQUAL.

161. VALVE BOXES SHALL BE 5-1/4 INCH DIAMETER SHAFT SUITABLE FOR 7.5 FEET OF COVER OVER THE TOP OF THE WATERMAIN. BOXES SHALL BE CAST IRON SCREW TYPE THREE PIECE BOXES WITH THE WORK "WATER" ON THE LID. VALVE BOXES SHALL BE TYLER 6860 WITH 5-1/4 INCH DROP LID, OR EQUAL.

162. THE PRIMARY LINE AND GRADE WILL BE ESTABLISHED FROM THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SETTING LINE AND GRADE STAKES PARALLEL TO THE PROPOSED PIPELINE AT AN APPROPRIATE OFFSET AND INTERVAL AS WILL SERVE THE CONTRACTORS OPERATIONS WHEREVER PRACTICAL, AT EACH CHANGE IN LINE OR GRADE, AND AS NEEDED FOR PIPELINE APPURTENANCES AND SERVICE LINES.

163. THE CONTRACTOR SHALL ARRANGE HIS OPERATIONS TO AVOID UNNECESSARY INTERFERENCE WITH THE ESTABLISHED PRIMARY LINE AND GRADE STAKES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRESERVATION OF THE PRIMARY STAKES AND SHALL RESTAKE AS NECESSARY.

164. IN CERTAIN LOCATIONS WHERE WATERMAIN IS IN DIRECT CONFLICT WITH STORM OR SANITARY SEWER, THE WATERMAIN SHALL BE CONSTRUCTED UNDER THE SEWER. VERTICAL BENDS CAN BE USED WHEN NECESSARY.

165. NO DEVIATION SHALL BE MADE FROM THE REQUIRED LINE OR GRADE WITHOUT THE CONSENT OF THE ENGINEER.

166. IN AREAS OF CONFLICT BETWEEN WATERMAINS, HOUSE SEWERS, STORM SEWERS, A SEPARATION OF AT LEAST 12 INCHES BETWEEN THE WATERMAIN AND SEWER SHALL BE PROVIDED. WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION AS DESCRIBED, THE FOLLOWING CONSTRUCTION SHALL BE USED:

1) SEWERS PASSING OVER OR UNDER WATER MAINS SHALL BE CONSTRUCTED OF MATERIALS EQUAL TO WATER MAIN STANDARDS OF CONSTRUCTION FOR A DISTANCE OF AT LEAST 9 FEET ON EITHER SIDE OF THE WATER MAIN.

2) WATER MAIN PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:

A) ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING ON AND BREAKING OF THE WATER MAINS; AND

B) THAT THE LENGTH OF WATER PIPE BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

WATER MAINS SHALL BE LAID AT LEAST 10 FEET HORIZONTALLY FROM ANY SANITARY SEWER, STORM SEWER OR SEWER MANHOLE, WHENEVER POSSIBLE. WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF 10 FEET A WATER MAIN MAY BE LAID CLOSER TO A STORM OR SANITARY SEWER PROVIDED THAT:

1) THE BOTTOM OF THE WATER MAIN IS AT LEAST 12 INCHES ABOVE THE TOP OF THE SEWER;

2) WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF MATERIALS WITH JOINTS THAT ARE EQUIVALENT TO WATER MAIN STANDARDS OF CONSTRUCTION AND SHALL BE PRESSURE TESTED TO ASSURE WATER TIGHTNESS PRIOR TO BACKFILLING.

167. EXCAVATING OPERATIONS SHALL PROCEED ONLY SO FAR IN ADVANCE OF PIPE LAYING AS WILL SATISFY THE NEEDS FOR COORDINATION OF WORK AND PERMIT ADVANCE VERIFICATION OF UNOBSTRUCTED LINE AND GRADE AS PLANNED. WHERE INTERFERENCE WITH EXISTING STRUCTURES IS POSSIBLE OR IN ANY WAY INDICATED, AND WHERE NECESSARY TO ESTABLISH ELEVATION OR DIRECTION FOR CONNECTIONS TO INPLACE STRUCTURES, THE EXCAVATING SHALL BE DONE AT THOSE LOCATIONS IN ADVANCE OF THE MAIN OPERATION SO ACTUAL CONDITIONS WILL BE EXPOSED IN SUFFICIENT TIME TO MAKE ADJUSTMENTS WITHOUT RESORTING TO EXTRA WORK OR UNNECESSARY DELAY.

168. ALL INSTALLATIONS SHALL BE ACCOMPLISHED BY OPEN TRENCH CONSTRUCTION EXCEPT WHERE BORING AND JACKING OR TUNNEL CONSTRUCTION METHODS SHALL BE EMPLOYED AS SPECIFICALLY REQUIRED BY THE PLANS OR APPROVED BY THE ENGINEER. SURFACE STRUCTURES MUST BE PROPERLY SUPPORTED AND THE BACKFILL RESTORED TO THE SATISFACTION OF THE ENGINEER.

169. THE EXCAVATION OPERATIONS SHALL BE CONDUCTED TO CAREFULLY EXPOSE ALL INPLACE UNDERGROUND STRUCTURES WITHOUT DAMAGE. WHEREVER THE EXCAVATION EXTENDS UNDER OR APPROACHES CLOSE TO AN EXISTING STRUCTURE AS TO ENDANGER IT IN ANY WAY, PRECAUTIONS AND PROTECTIVE MEASURES SHALL BE TAKEN AS NECESSARY TO PRESERVE THE STRUCTURE AND PROVIDE TEMPORARY SUPPORT. HAND METHODS OF EXCAVATING SHALL BE UTILIZED TO PROBE FOR AND EXPOSE SUCH CRITICAL OR HAZARDOUS INSTALLATIONS AS GAS PIPE AND POWER OR TELEPHONE CABLES.

170. TRENCH EXCAVATING SHALL BE TO A DEPTH THAT WILL PERMIT PREPARATION OF FOUNDATION, AS SPECIFIED, AND INSTALLATION OF THE PIPELINE AND APPURTENANCES AT THE PRESCRIBED LINE AND GRADE EXCEPT WHERE ALTERATIONS AND SPECIFICALLY AUTHORIZED. TRENCH WIDTHS SHALL BE SUFFICIENT TO PERMIT THE PIPE TO BE LAID AND JOINED PROPERLY AND THE BACKFILL TO BE PLACED AND COMPACTED AS SPECIFIED. EXTRA WIDTH SHALL BE PROVIDED AS NECESSARY TO PERMIT CONVENIENT PLACEMENT OF SHEETING AND SHORING AND TO ACCOMMODATE PLACEMENT OF APPURTENANCES.

171. EXCAVATIONS SHALL BE EXTENDED BELOW THE BOTTOM OF STRUCTURE GRADE, AS NECESSARY TO ACCOMMODATE ANY REQUIRED GRANULAR BEDDING MATERIAL. WHEN UNSTABLE FOUNDATION MATERIALS ARE ENCOUNTERED AT THE ESTABLISH GRADE, ADDITIONAL MATERIALS SHALL BE REMOVED AS SPECIFIED OR ORDERED BY THE ENGINEER TO PRODUCE AN ACCEPTABLE FOUNDATION. ALL EXCAVATIONS BELOW GRADE SHALL BE TO A MINIMUM WIDTH EQUAL TO THE OUTSIDE PIPE DIAMETER PLUS 2 FEET.

172. TRENCH WIDTHS SHALL ALLOW FOR AT LEAST SIX INCHES OF CLEARANCE ON EACH SIDE OF THE JOINT HUBS. THE MAXIMUM ALLOWABLE WIDTH OF THE TRENCH AT THE TOP OF PIPE LEVEL SHALL BE THE OUTSIDE DIAMETER OF THE PIPE PLUS TWO FEET. THE WIDTH OF THE TRENCH AT THE GROUND SURFACE SHALL BE HELD TO A MINIMUM TO PREVENT UNNECESSARY DESTRUCTION OF THE SURFACE STRUCTURES WHILE MAINTAINING SAFE WORKING CONDITIONS.

173. THE MAXIMUM ALLOWABLE TRENCH WIDTH AT THE LEVEL OF THE TOP OF PIPE MAY BE EXCEEDED ONLY BY APPROVAL OF THE ENGINEER, AFTER HIS CONSIDERATION OF PIPE STRENGTH AND LOADING RELATIONSHIPS. ANY ALTERNATE PROPOSALS MADE BY THE CONTRACTOR SHALL BE IN WRITING, GIVE THE PERTINENT SOIL WEIGHT DATA AND PROPOSED PIPE STRENGTH ALTERNATE, AND SHALL BE MADE IN A TIMELY MANNER SO AS NOT TO DELAY THE PROJECT. APPROVAL OF ALTERNATE PIPE DESIGNS SHALL BE WITH THE UNDERSTANDING THAT NO EXTRA COMPENSATION WILL BE ALLOWED FOR ANY INCREASE IN MATERIAL OR CONSTRUCTION COSTS.

174. FOUNDATION PREPARATIONS SHALL BE CONDUCTED TO PRODUCE A STABLE FOUNDATION AND PROVIDE CONTINUOUS AND UNIFORM PIPE BEARING BETWEEN BELL HOLES.

175. IN EXCAVATIONS MADE BELOW GRADE TO REMOVE UNSUITABLE MATERIALS, THE BACKFILLING TO GRADE SHALL BE MADE WITH GRANULAR MATERIAL. PLACEMENT OF THE BACKFILL SHALL BE IN RELATIVELY UNIFORM LAYERS NOT EXCEEDING 8 INCHES IN LOOSE THICKNESS. EACH LAYER OF BACKFILL SHALL BE COMPACTED THOROUGHLY, BY MEANS OF APPROVED MECHANICAL COMPACTION EQUIPMENT, TO PRODUCE UNIFORM PIPE SUPPORT THROUGHOUT THE FULL PIPE LENGTH AND FACILITATE PROPER SHAPING OF THE PIPE BED.

DATE	NO:	REVISION
SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
PROJECT SPECIFICATIONS

SCALE: AS SHOWN | JOB NO: 20-089
DRAWN BY: JP | DRAWING #: SP1.2
DATE: JAN 2021

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ⅛"=1'-0" ON 11x17 SHEET)

176. CARE SHALL BE TAKEN DURING FINAL SUBGRADE SHAPING TO PREVENT ANY OVER-EXCAVATION. SHOULD ANY LOW SPOTS DEVELOP, THEY SHALL ONLY BE FILLED WITH GRANULAR MATERIAL, WHICH SHALL BE COMPACTED THOROUGHLY. THE FINISHED SUBGRADE SHALL NOT BE DISTURBED DURING PIPE LOWERING OPERATIONS EXCEPT AS NECESSARY TO REMOVE PIPE SLINGS. THE DISCHARGE OF TRENCH DEWATERING PUMPS SHALL BE DIRECTED TO NATURAL DRAINAGE CHANNELS OR STORM DRAINS IN A MANNER WHICH DOES NOT CAUSE DAMAGE TO PRIVATE OR PUBLIC PROPERTY. ANY DEBRIS LEFT BY DEWATERING OPERATION SHALL BE CLEANED UP IMMEDIATELY BY THE CONTRACTOR. DRAINING TRENCH WATER INTO SANITARY SEWERS OR COMBINED SEWERS WILL NOT BE PERMITTED.

177. THE CONTRACTOR SHALL INSTALL AND OPERATE A DEWATERING SYSTEM TO MAINTAIN PIPE TRENCHES FREE OF WATER WHENEVER NECESSARY OR AS DIRECTED BY THE ENGINEER TO MEET THE INTENT OF THESE SPECIFICATIONS.

178. INSPECTION, HANDLING, AND ALL ASPECTS OF THE INSTALLATION OF THE PIPE, SERVICES, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, AND AS SUPPLEMENTED AS FOLLOWS:

A) INSPECTION AND HANDLING: PROPER AND ADEQUATE IMPLEMENTS, TOOLS, AND FACILITIES HALL BE PROVIDED AND USED THE CONTRACTOR FOR THE SAFE AND CONVENIENT PROSECUTION OF THE WORK. UNLOADING, DISTRIBUTION, AND STORAGE OF PIPE AND APPURTENANT MATERIALS ON THE JOB SITE SHALL BE AT A LOCATION APPROVED BY THE ENGINEER. ALL MATERIALS SHALL BE HANDLED CAREFULLY, AS WILL PREVENT DAMAGE TO PROTECTIVE COATINGS, LININGS, AND JOINT FITTINGS; PRECLUDE CONTAMINATION OF INTERIOR AREAS; AND TO AVOID JOLTING CONTACT, DROPPING OR DUMPING.

BEFORE BEING LOWERED INTO LAYING POSITION, THE CONTRACTOR SHALL MAKE A THOROUGH VISUAL INSPECTION OF EACH PIPE SECTION AND APPURTENANT UNITS TO DETECT DAMAGE OR UNSOUND CONDITIONS THAT MAY NEED CORRECTIVE ACTION OR BE CAUSE FOR REJECTION. INSPECTION PROCEDURE SHALL BE AS APPROVED BY THE ENGINEER, WITH SPECIAL METHODS BEING REQUIRED, AS HE DEEMS NECESSARY TO CHECK OUT SUSPECTED DEFECTS MORE DEFINITELY. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY DEFECTS DISCOVERED AND THE ENGINEER WILL PRESCRIBE THE REQUIRED CORRECTIVE ACTION OR ORDER REJECTION.

IMMEDIATELY BEFORE PLACEMENT, THE JOINT SURFACES OF EACH PIPE SECTION AND FITTING SHALL BE INSPECTED FOR THE PRESENCE OF FOREIGN MATTER, COATING BLISTERS, ROUGH EDGES OR PROJECTIONS, AND ANY IMPERFECTIONS SO DETECTED SHALL BE CORRECTED BY CLEANING, TRIMMING, OR REPAIRS AS NEEDED.

B) PIPE LAYING OPERATIONS: TRENCH EXCAVATION AND BEDDING PREPARATIONS SHALL PROCEED AHEAD OF PIPE PLACEMENT AS WILL PERMIT PROPER LAYING AND JOINING OF THE UNITS AT THE PRESCRIBED GRADE AND ALIGNMENT WITHOUT UNNECESSARY DEVIATION OR HINDRANCE.

ALL FOREIGN MATTER OR DIRT SHALL BE REMOVED FROM THE INSIDE OF THE PIPE AND FITTINGS BEFORE THEY ARE LOWERED INTO POSITION IN THE TRENCH AND THEY SHALL BE KEPT CLEAN BY APPROVED MEANS DURING AND AFTER LAYING. THE SEWER MATERIALS SHALL BE CAREFULLY LOWERED INTO LAYING POSITION BY THE USE OF SUITABLE RESTRAINING DEVICES. UNDER NO CIRCUMSTANCES SHALL THE PIPE BE DROPPED INTO THE TRENCH.

AT THE TIME OF PIPE PLACEMENT, THE BEDDING CONDITIONS SHALL BE SUCH AS TO PROVIDE UNIFORM AND CONTINUOUS SUPPORT FOR THE PIPE BETWEEN BELL HOLES. BELL HOLES SHALL BE EXCAVATED AS NECESSARY TO MAKE THE JOINT CONNECTIONS, BUT THEY SHALL BE NO LARGER THAN WOULD BE ADEQUATE TO SUPPORT THE PIPE THROUGHOUT ITS LENGTH. NO PIPE MATERIAL SHALL BE LAID IN WATER OR WHEN THE TRENCH OR BEDDING CONDITIONS ARE OTHERWISE UNSUITABLE OR IMPROPER.

WHEN PLACEMENT OR HANDLING PRECAUTIONS PROVE INADEQUATE, IN THE ENGINEER'S OPINION, THE CONTRACTOR SHALL PROVIDE AND INSTALL SUITABLE PLUGS OR CAPS EFFECTIVELY CLOSING THE OPEN ENDS OF EACH PIPE SECTION BEFORE IT IS LOWERED INTO THE LAYING POSITION, AND THEY SHALL REMAIN SO COVERED UNTIL REMOVAL IS NECESSARY FOR CONNECTION OF AN ADJOINING UNIT.

UNLESS OTHERWISE PERMITTED BY THE ENGINEER, BELL AND SPIGOT PIPE SHALL BE LAID WITH THE BELL ENDS FACING UPGRADE AND THE LAYING SHALL START ON THE DOWNGRADE END AND PROCEED UPGRADE. AS EACH LENGTH OF BELL AND SPIGOT PIPE IS PLACED IN LAYING POSITION, THE SPIGOT END SHALL BE CENTERED IN THE BELL AND THE PIPE FORCED HOME AND BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH APPROVED BACKFILL MATERIAL, WHICH SHALL BE THOROUGHLY COMPACTED BY TAMPING AROUND THE PIPE OUT TO THE TRENCH WALL.

CONNECTION OF PIPE TO EXISTING LINES OR PREVIOUSLY CONSTRUCTED MANHOLES SHALL BE ACCOMPLISHED AS SHOWN IN THE PLANS OR AS OTHERWISE APPROVED BY THE ENGINEER. ALL STRUCTURE PENETRATIONS SHALL BE MADE WITH THE USE OF WATERSTOP SEALS.

AT ALL TIMES WHEN PIPE LAYING IS NOT IN PROGRESS, INCLUDING NOON HOUR AND OVERNIGHT PERIODS, ALL OPEN ENDS OF THE PIPE LINE SHALL BE CLOSED BY WATERTIGHT PLUGS OR OTHER MEANS APPROVED BY THE ENGINEER. IF WATER IS PRESENT IN THE TRENCH, THE SEALS SHALL REMAIN IN PLACE UNTIL THE TRENCH IS PUMP COMPLETELY DRY.

INSTALLATION OF PVC SHALL CONFORM TO ASTM D 2321.

179. PVC PIPE JOINTS SHALL BE IN ACCORDANCE WITH AWWA MANUAL NO. M23.

180. THE CUTTING OF PIPE OF INSERTING VALVES, FITTINGS, OR CLOSURE PIECES SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER WITHOUT DAMAGE TO THE PIPE AND SHALL LEAVE A SMOOTH SQUARE-CUT END. PIPE SHALL BE CUT WITH APPROVED MECHANICAL CUTTERS.

WHEREVER IT IS NECESSARY TO DEFLECT THE PIPE FROM A STRAIGHT LINE EITHER IN THE VERTICAL OR HORIZONTAL PLANE, TO AVOID OBSTRUCTIONS, PLUMB STEMS, OR PRODUCE A LONG RADIUS CURVE WHEN PERMITTED, THE AMOUNT OF DEFLECTION ALLOWED AT EACH JOINT SHALL NOT EXCEED THE ALLOWABLE LIMITS FOR MAINTAINING SATISFACTORY JOINT SEAL AS GIVEN IN AWWA C600 FOR MECHANICAL JOINTS AND PUSH-ON JOINTS, OR AS OTHERWISE ALLOWED BY THE PIPE MANUFACTURE.

181. CONCRETE THRUST BLOCKS SHALL BE USED AT ALL LOCATIONS AS DETAILED ON THE PLANS.

182. SERVICE LINES AND VALVES, FOUR INCH AND LARGER, SHALL BE RESTRAINED FROM THE MAIN TO THE END OF THE SERVICE OR A MINIMUM OF 20 FEET TO ALLOW FUTURE EXCAVATION AND CONNECTION TO THE SERVICE STUB WITHOUT SHUTTING DOWN THE MAIN LINE WATER.

183. HYDRANTS AND LEADS SHALL BE RESTRAINED FROM THE MAIN TO THE HYDRANT OR A MINIMUM OF 20 FEET.

184. WET TAP WITH VALVE: THE TAPPING SLEEVE AND RESILIENT SEATED GATE VALVE ASSEMBLY SHALL BE INSTALLED ON THE WATERMAIN PIPE AFTER THOROUGHLY CLEANING THE PIPE TO BE TAPPED. THE SLEEVE SHALL BE ASSEMBLED ON THE PIPE AND THE BOLTS TIGHTENED PER THE MANUFACTURER'S SPECIFICATIONS. JOINT RESTRAINTS SHALL BE PROVIDED IN ACCORDANCE WITH THESE SPECIFICATIONS.

SHELL CUTTERS SHALL BE THE MAXIMUM SIZE ALLOWED FOR THE TAP BEING MADE. SIZE ON SIZE TAPS SHALL UTILIZE A ½ INCH UNDERSIZED SHELL CUTTER.

ELECTRICAL CONDUCTIVITY STRAPS SHALL BE PROVIDED TO BYPASS THE TAPPING SLEEVE ASSEMBLY.

185. UPON COMPLETING THE INSTALLATION ALL EXPOSED BOLTS AND NUTS SHALL BE COMPLETELY COATED WITH AN APPROVED BITUMINOUS RUST PREVENTATIVE COAL TAR MATERIAL. THE ENTIRE TAPPING SLEEVE AND VALVE ASSEMBLY SHALL BE POLYETHYLENE ENCASED.

WHENEVER SO REQUIRED BY THE PLANS OR SPECIFIC REQUIREMENTS, THE PIPELINE, INCLUDING VALVES, FITTING, AND APPURTENANCES, SHALL BE FULLY ENCASED IN POLYETHYLENE FILM OF 8-MIL NOMINAL THICKNESS. THE FILM SHALL BE FURNISHED IN TUBE FORM FOR INSTALLATION ON PIPE AND ALL PIPESHAPED APPURTENANCES SUCH AS BENDS, REDUCERS, OFFSETS, ETC. SHEET FILM SHALL BE PROVIDED AND USED FOR THE ENCASING ALL ODD-SHAPED APPURTENANCES SUCH AS VALVES, TEES, CROSSES, ETC. INSTALLATION SHALL BE IN ACCORDANCE WITH AWWA C105, TYPE A.

186. WATER SERVICE LINES COMPLETE WITH ALL REQUIRED APPURTENANCES, SHALL BE INSTALLED IN ACCORDANCE WITH ALL PERTINENT REQUIREMENTS FOR MAIN LINE INSTALLATIONS AND AS SUPPLEMENTED AS FOLLOWS.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO KEEP AN ACCURATE RECORD OF THE LOCATION, DEPTH AND SIZE OF EACH SERVICE CONNECTION AND OTHER PERTINENT DATA SUCH AS THE LOCATION OF CURB STOPS AND PIPE ENDINGS. TAP LOCATIONS SHALL BE RECORDED IN REFERENCE TO SURVEY LINE STATIONING. CURB BOXES SHALL BE TIED TO DEFINABLE LANDMARKS SUCH AS BUILDING CORNERS, FIRE HYDRANTS, MANHOLES AND TELEPHONE PEDESTALS. PIPE TERMINALS AT THE PROPERTY LINE SHALL BE MARKED ON THE GROUND SURFACE WITH A 2 INCH X 4 INCH X 8 FOOT WOOD POST EXTENDING 3 FEET ABOVE GRADE WITH THE TOP 2 FEET PAINTED BLUE.

WATER SERVICE LINES SHALL BE INSTALLED IN ACCORDANCE WITH LOCAL STANDARDS. WHERE WATER SERVICE LINES ARE INSTALLED ALONGSIDE OF SANITARY OR STORM SEWER SERVICE LINES, INSTALLATION SHALL MAINTAIN THE MINIMUM SPECIFIED CLEARANCES BETWEEN PIPELINES AND PROVIDE PROPER AND ADEQUATE BEARING FOR ALL PIPES AND APPURTENANCES. FOR SEPARATE INSTALLATION, THE TRENCH WIDTH SHALL NOT BE LESS THAN TWO FEET. SUBJECT TO MINIMUM CLEARANCES, THE WATER LINES MAY BE LAID IN A COMMON TRENCH EXCAVATED PRINCIPALLY FOR SEWER INSTALLATION, EITHER BY WIDENING THE TRENCH AS NECESSARY OR BY PROVIDING A SHELF IN THE TRENCH WALL WHERE GROUND STABILITY WILL PERMIT.

UNLESS OTHERWISE SPECIFIED, INSTALLATION OF WATER SERVICE LINES SHALL PROVIDE FOR NOT LESS THAN 18 INCHES OF CLEARANCE BETWEEN PIPELINES. ALSO, AT LEAST 6 INCHES OF CLEARANCE SHALL BE MAINTAINED IN CROSSING OVER OR UNDER OTHER STRUCTURES.

SERVICE TRENCHES SHALL BE RESTORED AND COMPACTED AS SPECIFIED.

187. VALVES, HYDRANTS, FITTINGS AND SPECIALS SHALL BE PROVIDED AND INSTALLED AS REQUIRED BY THE PLANS AND DETAIL PLATES, AND WITH EACH INSTALLATION ACCOMPLISHED IN ACCORDANCE WITH THE REQUIREMENTS FOR INSTALLATION OF MAINLINE PIPE TO THE EXTENT APPLICABLE. SUPPORT BLOCKING, THRUST BLOCKING, AND ANCHORAGE DEVICES SHALL BE PROVIDED AS REQUIRED BY THE PLANS AND DETAIL PLATES.

HYDRANTS SHALL BE INSTALLED PLUMB, WITH THE HEIGHT AND ORIENTATION OF NOZZLES AS SHOWN ON THE PLANS AND DETAILS. THE LARGE PUMPER NOZZLE SHALL BE ORIENTED SQUARELY FACING THE STREET. IF THE HYDRANT INSTALLATION RESULTS IN THE PUMPER NOZZLE NOT FACING THE STREET, THE HYDRANT HEAD SHALL BE ROTATED ACCORDINGLY. THE TRAFFIC FLANGE OF THE HYDRANT SHALL BE SET WITH THE BOTTOM OF THE FLANGE 2 INCHES ABOVE FINISH GRADE. WHEN A HYDRANT BARREL EXTENSION IS INSTALLED THE TRAFFIC FLANGE SHALL BE ADJUSTED TO REMAIN AT 2 INCHES ABOVE THE FINISH GRADE.

A DRAINAGE PIT OF A MINIMUM VOLUME OF ONE CUBIC YARD SHALL BE CONSTRUCTED AROUND THE HYDRANT BASE AND FILLED WITH ¾ TO 1- ½ INCH DRAIN ROCK FIRMLY COMPACTED UNDER AND AROUND THE HYDRANT BASE AND TO 6 INCHES ABOVE THE HYDRANT DRAIN HOLE. THE DRAIN ROCK SHALL BE COVERED WITH GEOTEXTILE FABRIC, 6-MIL POLYETHYLENE, OR TWO LAYERS OF TARPAPER PRIOR TO BACKFILLING. HYDRANT DRAIN HOLES SHALL NORMALLY BE LEFT OPEN. HYDRANTS LOCATED WHERE THE GROUNDWATER IS ABOVE THE DRAIN HOLE SHALL HAVE THE OUTLET FACTORY PLUGGED TO ENSURE PROPER PLUG INSTALLATION. THE HYDRANT SHALL HAVE A PERMANENT TAG ATTACHED STATING "PUMP AFTER USE". THE PUMPER NOZZLE SHALL BE FACTORY PAINTED IN ACCORDANCE WITH THE CITY STANDARD TO IDENTIFY THE HYDRANT AS HAVING A PLUGGED DRAIN HOLE AND NEEDING TO BE PUMPED OUT AFTER USE.

VALVES SHALL HAVE A PIECE OF GEOTEXTILE FABRIC, 4 FEET BY 4 FEET, PLACED CENTERED OVER THE VALVE BODY, PRIOR TO INSTALLING THE BOTTOM SECTION OF THE VALVE BOX, TO PREVENT SOIL MIGRATION INTO THE VALVE BOX ASSEMBLY. THE VALVE BOX SHALL BE CENTERED OVER THE OPERATING NUT OF THE VALVE, INSTALLED PLUMB, AND THE BOX COVER SET TO FINISH GRADE IN ACCORDANCE WITH THE PAVEMENT REQUIREMENTS. VALVE BOXES SHALL BE INSTALLED SO AS TO NOT TRANSMIT SHOCK OR STRESS TO THE VALVE. THE CONTRACTOR SHALL TAKE EXTRA CARE IN BACKFILLING AND COMPACTING AROUND THE VALVE BOX ASSEMBLY TO ENSURE PLUMBNESS AND EASE OF KEYING THE VALVE UPON FINAL INSTALLATION.

ALL DEAD END LINES SHALL BE TERMINATED WITH A PLUG OR CAP AND RESTRAINED, RODDED, OR THRUST BLOCKED. IF THE PIPE SIZE IS REDUCED NEAR THE END OF LINE, RESTRAINTS SHALL BE SIZED FOR THE PIPE SIZE PRIOR TO THE REDUCTION. A 4-INCH X 4-INCH X 6 FOOT WOOD POST MARKER SHALL BE INSTALLED AT THE END OF THE LINE. THE MARKER SHALL BE INSTALLED WITH 4 FEET BURIED IN THE GROUND AND 2 FEET EXPOSED ABOVE GROUND.

SPECIAL APPURTENANCES SHALL BE INSTALLED AS SHOWN ON THE PLANS.

188. BEFORE BEING PLACED IN SERVICE, THE COMPLETED WATERMAIN INSTALLATION SHALL BE DISINFECTED AND FLUSHED, AND AFTER THE FINAL FLUSHING THE WATER SHALL BE TESTED FOR BACTERIOLOGIC QUALITY AND FOUND TO MEET THE STANDARDS PRESCRIBED BY THE HEALTH DEPARTMENT. THE DISINFECTION MATERIALS AND PROCEDURES AND THE COLLECTION AND TESTING OF WATER SAMPLES SHALL AT A MINIMUM BE IN ACCORDANCE WITH THE PROVISIONS OF AWWA C651, DISINFECTING WATERMAINS, AND AS WILL MEET THE REQUIREMENTS OF THE HEALTH DEPARTMENT.

WHERE AN EXISTING WATERMAIN IS CUT FOR THE INSTALLATION OF A HYDRANT, FOR LOWERING THE WATERMAIN, OR FOR REASONS DETERMINED BY THE ENGINEER, THE PIPE AND FITTINGS PROPOSED TO BE I NSTALLED SHALL BE DISINFECTED PRIOR TO INSTALLATION AS FOLLOWS:

THE INTERIOR OF THE PIPE AND FITTINGS SHALL BE CLEANED OF ALL DIRT AND FOREIGN MATERIAL.

THE INTERIOR OF THE PIPE AND FITTINGS SHALL BE THOROUGHLY SWABBED OR SPRAYED WITH 1- PERCENT MINIMUM HYPOCHLORITE SOLUTION.

UNLESS OTHERWISE INDICATED IN THE PLANS, SPECIFICATIONS, AND SPECIFIC REQUIREMENTS, THE CONTRACTOR SHALL FURNISH AND PERFORM THE DISINFECTING, FLUSHING, AND TESTING AS NECESSARY FOR MEETING THE WATER QUALITY REQUIREMENTS. THE AWWA C651 PROVISIONS FOR DISINFECTION OF WATERMAIN ARE REPRODUCED FOR INFORMATIONAL PURPOSES AS FOLLOWS:

A) TABLET METHOD

TABLET METHOD MAY BE USED ONLY WHEN SCRUPULOUS CLEANLINESS HAS BEEN PRACTICED TO EXCLUDE ALL FOREIGN MATERIALS AND GROUND WATER DURING PIPE I NSTALLATION. IF GROUND WATER HAS ENTERED PIPE DURING PIPE INSTALLATION, THE WATERMAIN SHALL BE FLUSHED AND THE CHLORINE-WATER SOLUTION METHOD SHALL BE USED.

PLACING CALCIUM HYPOCHLORITE GRANULES

DURING CONSTRUCTION, CALCIUM HYPOCHLORITE GRANULES SHALL BE PLACED AT THE UPSTREAM END OF THE FIRST SECTION OF PIPE, AT THE UPSTREAM END OF EACH BRANCH MAIN, AND AT 500-FOOT INTERVALS ALONG THE MAIN. THE QUANTITY OF GRANULES SHALL BE IN ACCORDANCE WITH THE FOLLOWING TABLE:

OUNCES OF CALCIUM HYPOCHLORITE GRANULES TO BE PLACED AT BEGINNING OF MAIN AND AT EACH 500-FOOT INTERVAL:

PIPE DIAMETER (INCH)	CALCIUM HYPOCHLORITE GRANULES (OZ.)
4	0.5
6	1.0
8	2.0
10	3.0
12	4.0
16 AND LARGER	8.0

PLACING CALCIUM HYPOCHLORITE TABLETS

ATTACH TABLETS ON THE TOP OF THE MAIN USING AN ADHESIVE SUCH AS PERMATEX NO. 1, PRODUCT OF LOCTITE CORP, OR EQUAL. IF TABLETS ARE NOT ATTACHED TO THE TOP AND WATER CONTACTS THEM THEY WILL REACT PRIOR TO THE DISINFECTION PERIOD. THE TABLE BELOW GIVES TABLETS REQUIRED PER PIPE SIZE AND LENGTH TO ACHIEVE 25 MG/1.

NUMBER OF 5-G HYPOCHLORITE TABLETS
REQUIRED FOR DOSE OF 25 MG/1

PIPE DIAMETER (INCH)	LENGTH OF PIPE IN FEET: 13 OR LESS	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	16

NUMBER OF 5-G TABLETS = .0012 D 2 L

D = PIPE DIAMETER, INCHES
L = PIPE LENGTH, FEET

BASED ON 3.25 GRAMS (65%) AVAILABLE CHLORINE PER TABLET.

THE MAIN SHALL BE FILLED WITH WATER AT A RATE NO GREATER THAN 1 FPS. PRECAUTIONS SHALL BE TAKEN TO ASSURE THAT AIR POCKETS ARE ELIMINATED. THE USE OF ADDITIONAL CURB STOPS TO BLEED AIR THROUGH AT HIGH POINTS MAY BE NECESSARY.

CHLORINATION: RESIDUAL OF 25 MG/L CHLORINATED WATER SHALL BE RETAINED IN THE PIPE FOR A MINIMUM OF 24 HOURS, 48 HOURS WHEN THE WATER TEMPERATURE IS BELOW 41F. VALVES AND HYDRANTS SHALL BE OPERATED TO ENSURE DISINFECTION.

B) CONTINUOUS FEED METHOD

CONTINUOUS FEED METHOD CONSISTS OF COMPLETELY FILLING THE MAIN, REMOVING ALL AIR POCKETS, FLUSHING TO REMOVE PARTICULATES, THEN FILLING THE MAIN WITH POTABLE WATER CHLORINATED SO THAT AFTER A 24 HOUR HOLDING PERIOD IN THE MAIN THERE WILL BE A FREE CHLORINE RESIDUAL OF NOT LESS THAN 10 MG/L. FLUSHING VELOCITY SHALL NOT BE LESS THAN 2.5 FPS, SEE TABLE BELOW.

REQUIRED FLOW AND OPENINGS TO FLUSH PIPELINES*
(40 PSI RESIDUAL PRESSURE IN WATERMAIN)

PIPE DIAMETER (INCH)	GPM FLOW 2.5 FPS VELOCITY	SIZE OF TAP ON WATERMAIN **	NUMBER OF OUTLETS	OUTLET SIZE (IN)
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2
16	1565	3-5/8	2	2-1/2

* WITH A 40 PSI PRESSURE IN THE WATERMAIN WITH THE HYDRANT FLOWING TO ATMOSPHERE, A 2-1/2 INCH HYDRANT OUTLET WILL DISCHARGE APPROXIMATELY 1000 GPM AND A 4-1/2 HYDRANT NOZZLE WILL DISCHARGE APPROXIMATELY 2500 GPM.

** SIZE OF TAP ON WATERMAIN WITH NO SIGNIFICANT LENGTH OF DISCHARGE PIPE.

WATER FROM THE EXISTING SYSTEM OR OTHER APPROVED SOURCE SHALL BE MADE TO FLOW AT A CONSTANT MEASURED RATE IN THE NEW MAIN. AT A POINT NOT MUCH MORE THAN 10 FEET DOWNSTREAM FROM BEGINNING THE NEW MAIN, WATER ENTERING THE NEW MAIN SHALL RECEIVE A DOSE OF CHLORINE FED AT A CONSTANT RATE SUCH THAT THE WATER WILL HAVE NOT LESS THAN 25 MG/L FREE CHLORINE. MEASURE THE CHLORINE CONCENTRATION AT REGULAR INTERVALS IN ACCORDANCE WITH STANDARD METHODS, AWWA M12, OR USING APPROPRIATE CHLORINE TEST KITS. THE FOLLOWING TABLE GIVES THE AMOUNT OF CHLORINE REQUIRED FOR VARIOUS PIPES:

CHLORINE REQUIRED TO PRODUCE 25 MG/L
CONCENTRATION IN 100 FT OF PIPE - BY DIAMETER

PIPE DIAMETER INCH	100 PERCENT CHLORINE LB.	1 PERCENT CHLORINE SOLUTIONS GAL.
4	.013	0.16
6	.030	0.36
8	.054	0.65
10	.085	1.02
12	.120	1.44
16	.217	2.60

1-% CHLORINE SOLUTION REQUIRES 1 LB. OF CALCIUM HYPOCHLORITE IN 8 GALLONS OF WATER.

STRONG CHLORINE SOLUTION IN THE MAIN BEING TREATED SHALL NOT FLOW INTO MAINS IN SERVICE. THE CHLORINATED WATER SHALL BE RETAINED IN THE MAIN FOR AT LEAST 24 HOURS, DURING WHICH TIME ALL VALVES AND HYDRANTS SHALL BE OPERATED IN ORDER TO DISINFECT THE APPURTENANCES. AT THE END OF THE 24 HOUR PERIOD THE TREATED WATER IN ALL PORTIONS OF THE MAIN SHALL HAVE A RESIDUAL OF NOT LESS THAN 10 MG/L FREE CHLORINE.

PREFERRED EQUIPMENT FOR APPLYING LIQUID CHLORINE IS A SOLUTION FEED VACUUM OPERATED CHLORINATOR IN COMBINATION WITH A BOOSTER PUMP FOR INJECTION THE CHLORINE GAS SOLUTION WATER INTO THE MAIN TO BE DISINFECTED.

C) FLUSHING

AFTER THE APPLICABLE RETENTION PERIOD, HEAVILY CHLORINATED WATER SHALL NOT REMAIN IN PROLONGED CONTACT WITH THE PIPE. CHLORINATED WATER SHALL BE FLUSHED FROM THE MAIN UNTIL CHLORINE CONCENTRATION IS NO HIGHER THAN GENERALLY IN THE SYSTEM FOR DOMESTIC USE.

THE ENVIRONMENT TO WHICH THE CHLORINATED WATER IS TO BE DISCHARGED SHALL BE INSPECTED. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT THE RECEIVING AREA IS NOT DAMAGED BY THE CHLORINATED WATER AND SHALL USE A REDUCING AGENT FOR NEUTRALIZATION WHEN NECESSARY.

REGISTERED PROFESSIONAL CIVIL ENGINEER • BERMUDA • No. 1[illegible] JAMIE R. PEHKONEN 10/19/2021

DATE	NO:	REVISION
SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT

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PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
PROJECT SPECIFICATIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	SP1.3
DATE:	JAN 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS. DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ⅛"=1'-0" ON 11x17 SHEET)

D) BACTERIOLOGICAL TESTS

AFTER FINAL FLUSHING AND BEFORE THE WATERMAIN IS PLACED IN SERVICE, SAMPLES OF WATER SHALL BE COLLECTED FROM THE END OF THE MAIN AND EACH BRANCH LINE FOR TESTING FOR BACTERIOLOGICAL QUALITY IN ACCORDANCE WITH STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, AND SHALL SHOW THE ABSENCE OF COLIFORM ORGANISMS. SAMPLES SHALL BE AT A RATE OF ONE PER EVERY 1000 FEET OF PIPE. A HIGHER RATE OF SAMPLING MAY BE REQUIRED TO INCLUDE ALL BRANCH LINE. IF WATER IN THE PIPE DOES NOT MEET THE MINNESOTA DEPARTMENT OF HEALTH REQUIREMENTS, DISINFECTION PROCEDURE SHALL BE REPEATED UNTIL MEETING THE REQUIREMENTS. ACCEPTANCE FORMS FROM THE GOVERNING AGENCY SHALL BE FURNISHED TO THE ENGINEER.

189. HYDROSTATIC TESTING OF WATERMAINS – EACH VALVED SECTION SHALL BE SUBJECTED TO A SEPARATE TWO-HOUR PRESSURE TEST AND, IF REQUIRED, THE LEAKAGE TEST PRESCRIBED HEREIN. TESTING FOR THE TWO-HOUR DURATION SHALL BE WITH HYDRANTS CLOSED, AND VALVES ON HYDRANT LEADS AND DEAD END LINES OPEN. WHEN SERVICE LINES HAVE STUBS EXTENDING BEYOND THE CURB STOPS, THE CURB STOPS SHALL BE IN THE OPEN POSITION AND THE PRESSURE TEST CONDUCTED AGAINST THE CAPPED EXTENSION. ONCE THIS PORTION OF THE TEST IS COMPLETE, THE VALVE ON THE HYDRANT LEADS AND DEAD END WATER LINES SHALL CLOSED AND HYDRANTS OPENED. THE SPECIFIED TEST PRESSURE SHALL BE APPLIED, AND THE TEST REPEATED FOR 15 MINUETS TO ESTABLISH THE CONDITION OF THE HYDRANT LEAD VALVES.

THIS SHALL APPLY TO BOTH THE PRESSURE AND LEAKAGE TEST. THE ENGINEER OR OWNER MAY REQUIRE THE CONTRACTOR TO TEST THE FIRST SECTION OF PIPE INSTALLED TO DEMONSTRATE THE CONTRACTORS ABILITY TO INSTALL THE PIPE IN AN ACCEPTABLE MANNER. WHEN THE CONNECTION TO THE EXISTING SYSTEM IS NOT MADE WITH A VALVE, THE CONTRACTOR SHALL TEST THE EXISTING SECTION TO THE FIRST AVAILABLE VALVE(S) TO DETERMINE THE CONDITION OF THE EXISTING SYSTEM, OR THE CONTRACTOR MAY MAKE PROVISIONS TO TEST HIS WORK SEPARATELY, PRIOR TO CONNECTION TO THE EXISTING SYSTEM, IN A MANNER ACCEPTABLE TO THE ENGINEER. ISOLATION OF THE CONTRACTOR'S WORK SHALL BE CONSIDERED INCIDENTAL.

WHEN WATERMAIN IS CONSTRUCTED, SEPARATED FROM THE ACTIVE SYSTEM, THE CONTRACTOR SHALL STILL BE REQUIRED TO CHLORINATE, PRESSURE TEST, AND FLUSH THE NEW WORK IN ACCORDANCE WITH THESE SPECIFICATIONS. THIS MAY REQUIRE ADDITIONAL WORK OPERATION TO FILL AND FLUSH THE SYSTEM. ALL COSTS ASSOCIATED WITH ANY ADDITIONAL WORK OR MATERIALS SHALL BE CONSIDERED INCIDENTAL TO THE WATERMAIN CONSTRUCTION.

THE CONTRACTOR SHALL FURNISH THE PUMP, PIPE CONNECTIONS, GAUGES, AND MEASURING EQUIPMENT, AND SHALL PERFORM THE TESTING IN THE PRESENCE OF THE ENGINEER. THE PRESSURE GAUGE FOR THE TEST SHALL BE AN ASHCORFT MODEL 1082 WITH 4-1/2 INCH DIAL FACE AND 1-PSI INCREMENTS. WHERE PERMANENT AIR VENTS ARE NOT PROVIDED, THE CONTRACTOR SHALL PROVIDE AND INSTALL CORPORATION COCKS AT THE HIGH POINTS AS NEEDED FOR RELEASE OF AIR AS THE LINE IS FILLED WITH WATER.

WHERE CONCRETE REACTION BLOCKING IS PLACED, THE WATERMAIN SHALL NOT BE SUBJECTED TO HYDROSTATIC PRESSURE UNTIL AT LEAST 5 DAYS HAVE ELAPSED AFTER THE CONCRETE PLACEMENT, WITH THE EXCEPTION THAT THIS PERIOD MAY BE REDUCED TO 2 DAYS WHERE HIGH EARLY STRENGTH CONCRETE IS USED.

AT THE OPTION OF THE ENGINEER, THE PRESSURE AND LEAKAGE TESTS MAY BE CONDUCTED SIMULTANEOUSLY. ANY DEFECTIVE JOINTS, PIPE, FITTINGS, VALVES, OR HYDRANTS REVEALED DURING THE TESTING OR BEFORE FINAL ACCEPTANCE OF THE WORK SHALL SATISFACTORY CORRECTED AND THE TESTS SHALL BE REPEATED UNTIL THE SPECIFIED REQUIREMENTS HAVE BEEN MET.

A) PRESSURE TEST: THE SECTION BEING TESTED SHALL BE SLOWLY FILLED WITH WATER AND THE SPECIFIED TEST PRESSURE SHALL BE APPLIED AFTER ALL AIR HAS BEEN EXPELLED FROM THE PIPE. A HYDROSTATIC PRESSURE OF 150 POUNDS PER SQUARE INCH, GAUGE PRESSURE, MEASURED T THE LOWEST POINT OF ELEVATION SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE IN A SATISIFACTORY MANNER.

THE GAUGE PRESSURE SHALL BE CHECKED AFTER A MINIMUM OF TWO HOURS. A PRESSURE DROP OF 1 PSI OR LESS OVER A 2-HOUR PERIOD SHALL BE CONSIDERED ACCEPTANCE FOR THE TEST SECTION. IF THE PRESSURE DROP IS GREATER THAN 1 PSI THE CONTRACTOR SHALL INVESTIGATE THE CAUSE AND TAKE CORRECTIVE ACTION. THE CONTRACTOR MUST MAKE EVERY EFFORT TO EXPEL ALL AIR IN THE TEST SECTION, WHICH MAY BE CAUSING A TEST FAILURE. THIS MAY REQUIRE THE CONTRACTOR TO TAP A CORPORATION AT A HIGH POINT OF THE MAIN ON THE TOP OF THE PIPE TO RELEASE TRAPPED AIR. ONLY IF SEVERAL CONSECUTIVE TESTS INDICATE A CONSISTENT PRESSURE DROP AND ONLY AFTER THE CONTRACTOR HAS MADE NUMEROUS ATTEMPTS TO RESOLVE THE PROBLEM, ACCEPTABLE TO THE ENGINEER, MAY THE CONTRACTOR REQUEST IN WRITING THE ENGINEER CONSIDER THE USE OF THE LEAKAGE TEST. THE LEAKAGE TEST MAY BE PERFORMED BY THE CONTRACTOR TO DETERMINE THE MAGNITUDE OF THE LEAK; HOWEVER, MEETING THE LEAKAGE ALLOWANCE SHALL NOT AUTOMATICALLY BE CONSIDERED ACCEPTANCE, IN LIEU OF THE PRESSURE TEST, FOR THE SECTION BEING TESTED.

SERVICE PIPE SHALL TYPICALLY BE TESTED IN CONJUNCTION WITH THE MAIN LINE TESTING. HOWEVER, SERVICES MAY BE TESTED SEPARATELY AT 100 PSI, WITH THE CORPORATION STOPS OPEN.

THE CONTRACTOR MAY HAVE TO PERFORM ADDITIONAL PRESSURE TESTING IF DURING THE FLUSHING OPERATION THERE IS EVIDENCE OF DEBRIS BEING FLUSHED OUT OF THE SYSTEM. THIS MAY BE DUE TO POOR CONSTRUCTION PRACTICES AND RESULT IN VALVES NOT CLOSING TIGHT AFTER HAVING DONE THE ORIGINAL PRESSURE TEST. RETESTING SHALL BE AT THE DISCRETION OF THE ENGINEER.

B) LEAKAGE TEST: AFTER AN UNSATISFACTORY PRESSURE TEST, AND IF AUTHORIZED IN WRITING BY THE ENGINEER A LEAKAGE TEST SHALL BE PERFORMED ON EACH VALVED SECTION OF WATERMAIN TO DETERMINE THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE SECTION TO MAINTAIN A TEST PRESSURE OF 150 POUNDS PER SQUARE INCH, AFTER THE AIR IN THE PIPELINE HAS BEEN EXPELLED AND THE PIPE HAS BEEN FILLED WITH WATER. THE WATER ADDED SHALL BE RECORDED TO THE NEAREST FLUID OUNCE.

AFTER FILLING THE PIPE WITH WATER AND EXPELLING ALL AIR IN THE LINE, A PRESSURE OF 150 PSI SHALL BE APPLIED IN THE SAME MANNER AS PRESCRIBED FOR THE PRESSURE TEST, AND SUFFICIENT WATER SHALL BE MEASURED AND SUPPLIED INTO THE PIPE SECTION TO MAINTAIN THE PRESSURE FOR A TEST DURATION OF 2 HOURS.

EACH PIPE SECTION TESTED WILL BE ACCEPTED IF THE LEAKAGE DOES NOT EXCEED THE QUANTITY DETERMINED BY THE FORMULA AS SHOWN IN THE TABLE BELOW, BASED ON AN ALLOWABLE LEAKAGE OF 11.65 GPD/MILE/NOMINAL DIAMETER INCH AT 150 PSI.

$$L = \frac{SD*(P^{0.5})}{133{,}200}$$

L = MAXIMUM PERMISSIBLE LEAKAGE IN GALLONS PER HOUR
S = LENGTH OF PIPE TESTED
D = NOMINAL DIAMETER OF PIPE IN INCHES
P = AVERAGE TEST PRESSURE DURING THE TEST, IN POUNDS PER SQUARE INCH, GAUGE PRESSURE.

ALLOWABLE LEAKAGE PER 1000 FEET OF PIPE
GALLONS PER HOUR

AVG.TEST PRESSURE	NOMINAL PIPE DIAMETER – IN.					
PSI	4	6	8	10	12	14
200	0.43	0.64	0.85	1.06	1.28	1.48
175	0.40	0.59	0.80	0.99	1.19	1.39
150	0.37	0.55	0.74	0.92	1.10	1.29
125	0.34	0.50	0.67	0.84	1.01	1.18
100	0.30	0.45	0.60	0.75	0.90	1.05
70	0.25	0.38	0.50	0.63	0.75	0.88

IF THE PIPE SECTION UNDER TEST CONTAINS PIPE OF VARIOUS DIAMETERS, THE ALLOWABLE LEAKAGE WILL BE THE SUM OF THE COMPUTED LEAKAGE FOR EACH SIZE.

WHEN REQUESTED, THE CONTRACTOR SHALL FURNISH A WRITTEN REPORT OF THE RESULTS OF LEAKAGE TESTS, WHICH SHALL IDENTIFY THE SPECIFIC TEST SECTION, THE AVERAGE PRESSURE, THE DURATION OF TEST, AND THE AMOUNT OF LEAKAGE.

PRE-CAST MANHOLES

190. PRE-CAST MANHOLES SHALL BE CONSTRUCTED OF PRE-CAST CONCRETE SECTIONS (ASTM C478), INTEGRAL BASE AND THE BARREL, RISER SECTION, ECCENTRIC CONE OR FLAT TOP, AND ADJUSTING RINGS. ALL UNITS SHALL BE PROPERLY FITTED AND SEALED TO FORM A COMPLETELY WATERTIGHT STRUCTURE. BARREL AND CONE HEIGHT SHALL BE SUCH AS TO PERMIT PLACEMENT OF AT LEAST TWO AND NOT MORE THAN FIVE STANDARD 0.2 FOOT PRE-CAST CONCRETE ADJUSTING RINGS, FOR A MAXIMUM HEIGHT OF 1.0 FOOT, IMMEDIATELY BELOW THE CASTING ASSEMBLY SET IN A FULL MORTAR BED, ¼ INCH TO ½ INCH THICK WITHOUT THE USE OF SHIMS OR BLOCKING. RINGS SHALL BE PLASTERED ON THE EXTERIOR TO FORM A WATERTIGHT SEAL.

191. WHEN PLACING THE PRE-CAST BASE, THE BEDDING SHALL BE SOLID AND COMPACTED TO THE GRADE NECESSARY PRIOR TO SETTING THE BASE. MANIPULATION OF THE BASE TO ACHIEVE THE PROPER GRADE WILL NOT BE ALLOWED. IF THE BASE IS LOW AND NEEDS FILL TO LEVEL IT OR IS HIGH AND MATERIAL MUST BE REMOVED, THE BASE SHALL BE REMOVED

192. JOINTS BETWEEN CONCRETE SECTIONS SHALL BE CONFINED "O" RING CONFORMING TO ASTM C361 AND C443, AND SHALL BE CRETEX CX-2 OR EQUAL.

RESTORATION OF SURFACE IMPROVEMENTS

193. WHEREVER ANY SURFACE IMPROVEMENTS SUCH AS PAVEMENT, CURBING, PEDESTRIAN WALKS, FENCING OR LANDSCAPING HAVE BEEN REMOVED, DAMAGED OR OTHERWISE DISTURBED BY THE CONTRACTOR'S OPERATION, THEY SHALL BE REPAIRED OR REPLACED IN KIND AND STRUCTURE TO THE PRE-EXISTING CONDITION OR BETTER. EACH ITEM OF RESTORATION WORK SHALL BE DONE AS SOON AS PRACTICAL AFTER COMPLETION OF INSTALLATION AND BACKFILLING OPERATIONS ON EACH SECTION OF PIPELINE.

194. EXISTING CONCRETE AND ASPHALT SURFACES AT THE TRENCH WALL SHALL BE SAWED OR CUT WITH A CUTTING WHEEL TO FORM A NEAT EDGE IN A STRAIGHT LINE BEFORE SURFACES ARE TO BE RESTORED. ALL SURFACE EDGES SHALL BE INSPECTED PRIOR TO RESTORATION.

OPERATIONAL INSPECTION

195. AT THE COMPLETION OF THE CONSTRUCTION, AS PART OF THE PUNCH LIST PREPARATION, THERE SHALL BE AN OPERATIONAL INSPECTION CONDUCTED BY THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER AND OWNER, TO ASCERTAIN THAT THE ENTIRE FACILITY IS IN GOOD WORKING ORDER. SPECIFIC ITEMS TO BE INSPECTED ARE THAT SERVICES ARE MARKED, OFF STREET MANHOLES ARE MARKED, CASTINGS ARE CENTERED PROPERLY, AND WHEN A FORCEMAIN IS CONSTRUCTED THAT VALVE BOXES ARE CENTERED ON THE VALVE, VALVES CAN BE KEYED, VALVES OPERATE SMOOTHLY, VALVES ARE IN THE OPEN POSITION, AND VALVE BOXES ARE SET TO PROPER GRADE.

FINAL CLEAN-UP

196. DO NOT DISPOSE OF ANY LIQUIDS, SLURRY, SPOILS OR CHEMICALS ON SITE EXCEPT AS DIRECTED BY THE OWNERS REPRESENTATIVE AND APPROVED BY THE DEPARTMENT OF ENVIRONMENT OR OTHER AGENCIES HAVING JURIDICTION.

197. FINAL DISPOSAL OF DEBRIS, WASTE MATERIALS, AND OTHER REMAINS OR CONSEQUENCES OF CONSTRUCTION, SHALL BE ACCOMPLISHED PRIOR TO FINAL ACCEPTANCE OF ALL WORK. THE OWNER MAY WITHHOLD PARTIAL PAYMENTS UNTIL SUCH WORK IS SATISFACTORILY PURSUED OR HE MAY DEDUCT THE ESTIMATED COST OF ITS PERFORMANCE FROM THE PARTIAL ESTIMATE VALUE.

REGISTERED PROFESSIONAL CIVIL ENGINEER · BERMUDA · No. 129 JAMES R. PEHKONEN 10/19/2021

SEPT 2021	-	ISSUED TO BUILDING CONTROL
JAN 2021	-	ISSUED TO CLIENT
DATE	NO:	REVISION

BRUNEL ENGINEERING CONSULTANTS
t: 441.297.6191 • info@brunel.bm • www.brunel.bm

PROJECT:
DPT BUS DEPOT
REFURBISHMENT PROJECT
ST. GEORGE'S, BERMUDA

TITLE:
PROJECT SPECIFICATIONS

SCALE:	AS SHOWN	JOB NO:	20-089
DRAWN BY:	JP	DRAWING #:	SP1.4
DATE:	JAN 2021		

DRAWING SCALE SHOWN IS FOR FULL-SIZE DRAWINGS, DRAWINGS PLOTTED ON 11x17 SHEETS ARE HALF SCALE SHOWN (¼"=1'-0" ON 24x36 SHEET = ⅛"=1'-0" ON 11x17 SHEET)

GENERAL NOTES

1. PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
The General Documents apply to work specified in this Section; consult them in detail for applicable instructions.

1.02 WORK INCLUDED:
Provide all labor, materials and equipment necessary to complete all work of this Section. Without restricting the generality of the foregoing, the following items of work are included:

a. PERMITS AND FEES
b. TEMPORARY POWER AND LIGHT
c. SERVICE PROVISIONS AND METERBANKS
d. PANELBOARDS
e. TELEPHONE PROVISIONS
f. RACEWAYS
g. BOXES
h. WIRING
i. GROUNDING
j. FIRE ALARM
k. LIGHTING FIXTURES AND LAMPS
L. WIRING DEVICES AND PLATES
m. CONNECTIONS TO EQUIPMENT
n. DIRECTORIES AND NAMEPLATES
o. TESTING
p. CLEANING AND REMOVAL OF RUBBISH
q. SUBMITTALS

1.03 RELATED WORK OF OTHER SECTIONS:
a. CONCRETE AND MASONARY
b. PAINTING

1.04 QUALITY ASSURANCE:
a. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work of this Section.

b. All work shall be of the highest quality in conformance with the best practices of the trade and in compliance with all governing codes.

1.05 CODES, PERMITS, FEES AND REGULATIONS:
a. All work shall be carried out in conformity with the rules and regulations of the NATIONAL ELECTRIC CODE, latest edition, and of the various local agencies having jurisdiction.

b. The Contractor shall give all necessary notices, obtain all permits and pay all governmental taxes, fees, deposits and other costs in connection with his work; file all necessary plans, prepare all documents and obtain necessary approvals of all agencies having jurisdiction; obtain all required Certificates of Inspection and approvals for his work and deliver same to the Architect before request for acceptance and final payment for the work.

1.06 STORAGE OF MATERIALS:
a. Store materials and equipment on the premises where directed by the Owner.

1.07 OTHER TRADES:
a. Bidders shall examine the site and the complete set of Plans and Specifications covering the entire project. They shall become fully conversant with the type of general construction as well as all pertinent facts affecting the cost of carrying out the work they will contract to perform.

b. This Contractor shall cooperate to the fullest with all other trades. He shall plan his work in such a way, and furnish all necessary equipment and information to the other trades so as not to delay any other trade or hinder the progress of the work.

1.08 SUBMITTALS:
a. Submit manufacturers technical product data literature for all materials specified herein. Indicate and high light on the submittals details of all items to indicate correct interpretation of the Contract Documents. Include submittals for the following:

1. FIRE PROTECTION SYSTEM
2. LIGHTING FIXTURES
3. WIRING DEVICES
4. PANELBOARDS
5. CONTACTORS/TIME CLOCKS

1.09 CONFLICTIONS:
a. Any contradictions between the written specifications and drawings shall be considered ambiguous, and will be the responsibility of the Bidder to secure clarification prior to Bidding.

2. PART 2 - PRODUCTS

2.01 GENERAL:
a. All material, equipment, and installations shall conform to the requirements of the following codes:

1. INTERNATIONAL BUILDING CODE (IBC)
2. INTERNATIONAL MECHANICAL CODE (IMC)
3. NATIONAL ELECTRIC CODE (NEC)
4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
5. ANY LOCAL JURISDICTIONAL CODES

2.02 SERVICE PROVISIONS:
a. REINSTATE EXISTING PRIMARY AND SECONDARY ELECTRIC AND TELEPHONE SERVICES IN MAIN ELECTRICAL ROOM.

2.03 PANELBOARDS:

a. REINSTATE EXISTING PANELBOARDS AS DETAILED ON THE DRAWINGS COMPLETE WITH REQUIRED CIRCUIT BREAKERS.

2.04 LIGHTING FIXTURES AND LAMPS:
a. The Contractor shall provide all lighting fixtures, poles, and luminaires in conformance with the fixture schedule on the drawings.

b. Provide lamps in all lighting fixtures and devices in accordance with the lighting fixture schedule.

c. Lamps shall be as indicated on fixture schedule.

d. Furnish photocell, time clocks, and contactors as required for site lighting control.

2.05 WIRING DEVICES:
a. Furnish and install quality devices bearing UL label for the service and electrical rating where used.

1. Switches shall be 20 ampere, 120/277 volt A.C. rated as scheduled in legend.

2. GFCI devices shall be 20 ampere duplex w/U ground pin.

2.06 RACEWAYS:
a. All branch circuit wiring shall be in EMT conduit within building.

b. Flexible metal conduit with approved type fittings may be used in limited lengths for connections to motors and recessed fixtures where it is necessary to provide flexible connections. It may also be used where the structure precludes the use of EMT.

c. All raceways shall be 3/4" minimum size.

2.07 OUTLET AND JUNCTION BOXES :
a. Outlet boxes for ceiling fixtures shall be 4" octagonal EMT boxes not less than 1/2" deep provided with 3/8" galvanized malleable iron fixture stud.

b. Concealed outlet boxes for wall brackets, switches, and receptacles shall be a 4" square EMTC box with raised cover of sufficient depth to accomodate wall surface material.

c. Exposed outlet boxes in dry locations for switches and receptacles shall be a 4" EMT box with heavy duty cover.

d. Boxes shall be EMT where installed flush. Where boxes are installed exposed they shall be of the EMT type.

2.08 WIRES AND CABLES:
a. Provide and install all wiring and cable as required to connect all electrical equipment and devices indicated on the plans.

b. All wires #10 gauge and smaller shall be solid copper 75 degree C, and 600 volt insulation.

c. All wires #8 gauge and larger shall be stranded copper, 75 degree C, and 600 volt insulation.

d. Fixture wires shall not be less than #14 gauge, and shall be type SFF-2.

e. Unless indicated otherwise all light and power conductors shall be #12 gauge minimum.

3. PART 3 - EXECUTION

3.01 WORKMANSHIP:
a. All work shall be installed in a neat workmanlike manner by competent mechanics thoroughly skilled in their respective trades and in strict accordance with code requirements and the respecive manufacturers instructions.

3.02 TEMPORARY LIGHT AND POWER:
a. Furnish and install temporary Light & Power as may be required by all Trades.

3.03 SUPPORTS:
a. Provide all materials and labor required to adequately support, brace and strengthen equipment and materials furnished as part of this work.

b. All raceways, boxes, etc., shall be supported directly from the structure, independent of duct, piping or other work.

c. All conduits shall be securely and independently supported so that no strain will be transmitted to outlet box and pull box supports, etc.

3.04 BRANCH CIRCUITS:
a. Provide all conduits, outlets, boxes, wires, switches, receptacles, etc., for a complete electrical system as shown on the drawings.

b. Contractor shall carefully check the Mechanical drawings and specifications to establish the extent of power and control wiring to be provided. Control wiring shall be the responsibility of others.

3.05 GROUNDING:
a. The electrical systems shall be completely and effectively grounded as required by the NATIONAL ELECTRIC CODE. All ground systems and connections shall be mechanically secure and electrically continuous.

3.06 LOCATION OF OUTLETS AND ELECTRICAL EQUIPMENT:
a. The plans show conditions as accurately as possible but do not necessarily show all the fittings, etc., necessary to suit building conditions. Locations of outlets, appliances, etc., are approximate and the Contractor shall be responsible for the proper locations in order to make them fit with the architectural details and also instructions from the Architects representative on the job site.

b. Before installation of conduit for switches, receptacles, ceiling lights or motors, the Owner, Architect, reserve the right to move each outlet location to better adapt them for usage, prior to installation, within a distance of three feet as presently indicated, at no additional cost to the Owner.

c. Unless indicated otherwise on the drawings, all devices shall be mounted at the height specified.

d. The Contractor shall carefully check with other Contractors to coordinate the location of electrical equipment with work of other trades.

e. Verify all door swings before roughing in for switches.

f. All electrical installations in area of new construction must be flush mounted. With the exception of surface mounted lighting fixtures, electrical equipment is not to be surface mounted without the approval of the ENGINEERr or ARCHITECT.

3.07 CLEANING AND REMOVAL OF RUBBISH:
a. Contractor shall at all times keep the premises free of all waste, surplus materials, rubbish or debris which is caused by his employees or resulting from his work.

b. After all equipment and devices have been installed, remove all labels, stickers, stains, temporary covers, etc. Identification plates on all equipment

3.08 GUARENTEE:
a. All material, equipment and installation shall be guarenteed for a period of ONE (1) YEAR from the date od acceptance, defects which appear during that period shall be corrected at this contractor's expense.

For the same period, the electrical contractor shall be responsible for any damage to the premises caused by defects in workmanship or in the work or equipment furnished and/or installed by this contractor.

1 / E100 ELECTRICAL NOTES DETAILS N.T.S

ELECTRICAL LEGEND

LIGHTING

- XX LED NARROW STRIP LIGHT
- XX WALL-MOUNTED FIXTURE
- XX LED VAPOUR-PROOF FIXTURE 6" X 4'
- XX LED FIXTURE 1' X 4'
- XX LED FIXTURE 2' X 4'
- XX LED FIXTURE 2' X 2'
- HATCH DENOTES LUMINAIRE ON EMERGENCY CIRCUIT
- HLV HEAT LIGHT VENT
- XX LED DOWNLIGHT RECESSED
- XX LED WALL SCONCE OR RECESSED STEP LIGHT
- XX LED PENDANT
- XX LED WALL WASHER RECESSED
- XX LED WALL WASHER
- XX LED WALL MOUNT
- XX LED POLE-TOP FIXTURE
- XX LED IN-GROUND / SLAB FIXTURE
- EL LED EMERGENCY LIGHT
- EXIT LIGHTED LED EXIT SIGN

RECEPTACLE

- X X WALL-MOUNTED DUPLEX
- WALL-MOUNTED DUPLEX DEDICATED
- WALL-MOUNTED QUAD
- WALL-MOUNTED SPLIT
- WALL-MOUNTED SINGLE
- WALL-MOUNTED DUPLEX, 2 USB CHARGERS
- WALL-MOUNTED GFI
- WALL-MOUNTED SWITCHED
- WALL-MOUNTED ISOLATED GROUND
- WALL-MOUNTED 240V
- CEILING-MOUNTED DUPLEX
- CEILING-MOUNTED SINGLE
- DIRECT CONNECTION OUTLET
- X FLOOR-MOUNTED SINGLE
- X FLOOR-MOUNTED DUPLEX
- X FLOOR-MOUNTED DEDICATED
- FLOOR-MOUNTED QUAD

LIGHTING CONTROL

- $ LIGHT SWITCH - SINGLE POLE, 120 VOLT
- $3 LIGHT SWITCH - THREE-WAY, 120VOLT
- $D DIMMER SWITCH
- $M MECHANICAL SWITCH - SINGLE POLE, 120 VOLT
- $P LIGHT SWITCH C/W ROCKER PILOT LIGHT
- OCCUPANCY SWITCH
- ECLU EMERGENCY LIGHTING CONTROL UNIT
- OCCUPANCY SENSOR
- DAYLIGHT PHOTOCELL SENSOR
- Z (X) ZONE DIGITAL TIMER

POWER DISTRIBUTION AND CONNECTION

- X SURFACE-MOUNT PANELBOARD
- X RECESSED PANELBOARD
- M UTILITY METER
- DISTRIBUTION TRANFORMER
- J JB JUNCTION BOX (20A,120V UNLESS OTHERWISE NOTED)
- DS DISCONNECT SWITCH
- MS COMBINATION MAGNETIC STARTER
- VFD VARIABLE FREQUENCY DRIVE
- COMBINATION LIGHT & MOTOR CONNECTION
- SINGLE PHASE MOTOR CONNECTION
- THREE PHASE MOTOR CONNECTION

COMMUNICATIONS

- X COMMS PANEL
- VOICE
- SINGLE-GANG AUDIO/VISUAL
- DOUBLE-GANG AUDIO/VISUAL
- X VOICE/DATA
- WAP WIRELESS ACCESS POINT (WAP)
- MS INTERCOM SYSTEM STATION (MASTER/SLAVE)
- DOORBELL
- C COMMUNICATIONS TERMINATIONS ENCLOSURE
- TV TELEVISION
- S MUSIC SPEAKER
- CATV

FIRE ALARM

- X FIRE ALARM CONTROL PANEL
- X ANNUNCIATOR PANEL
- X DGP DATA GATHERING PANEL
- PS FIRE ALARM PULLSTATION
- S ST STROBE
- HS HORN/STROBE COMBINATION
- SD SMOKE DETECTOR
- SD SMOKE DETECTOR, DUCT-MOUNTED
- HD HEAT (THERMAL) DETECTOR
- FE FE FIRE EXTINGUSHIER
- S SP FIRE ALARM SPEAKER/STROBE COMBINATION
- FSDR FIRE ALARM FAN SHUTDOWN RELAY
- EOL END-OF-LINE RESISTOR

SPRINKLER

- FS SPRINKLER - FLOW SWITCH
- PS SPRINKLER - PRESSURE SWITCH
- SV SPRINKLER - SUPERVISED VALVE
- CV SPRINKLER - ALARM CHECK VALVE
- FIREMAN'S HANDSET
- DO DOOR HOLD OPEN DEVICE
- SMOKE DAMPER CONNECTOION

ACCESS CONTROL

- X CAP CARD ACCESS PANEL
- BARRIER-FREE DOOR OPERATOR PB
- KP KEY PAD
- CR CARD READER
- DC DOOR CONTACT
- ML ELECTRO-MAGNETIC DOOR LOCK
- ES ELECTRIC STRIKE
- EL ELECTRIC LOCK
- EL DOOR RELEASE PUSHBUTTON
- S REQUEST TO EXIT MOTION SENSOR

SECURITY

- X SECURITY PANEL
- MOTION DETECTOR
- WINDOW/DOOR CONTACT
- R SECURITY RACK
- W SECURITY WORKSTATION C/W 24" LCD DISPLAY, KEYBOARD, OPT MOUSE
- CCTV VIDEO SURVEILLANCE FIXED IP-BASED DOME CAMERA

ABBREVIATIONS

AC	AIR CONDITIONER
AFF	ABOVE FINISHED FLOOR
C/C	CONDUIT
C/W	COMPLETE WITH
CU	CONDENSING UNIT
DL	DIMMER LIGHT
EC	EMPTY CONDUIT
EF	EXHAUST FAN
GFI/GFCI	GROUND FAULT CIRCUIT INTERRUPTER
HWH	HOT WATER HEATER
LSIG	ELECTRONIC TRIP UNIT C/W LONG SHORT INSTANTANEOUS GROUND FAULT SETTINGS
E	EXISTING TO REMAIN
R	EXISTING TO BE REMOVED
ER	EXISTING IN RELOCATED POSITION
JB	JUNCTION BOX
TL	TWIST-LOCK
WP	WEATHER-PROOF

2 / E100 ELECTRICAL LEGEND DETAILS N.T.S

REV.#	REV. Date	REV. Notes

REGISTERED PROFESSIONAL ENGINEER No. 87 C. JAY O'CONNOR September 2021 BERMUDA

islandautomation limited
mechanical and electrical consulting engineers
Tel: 441.505.1888 • email: ial@logic.bm

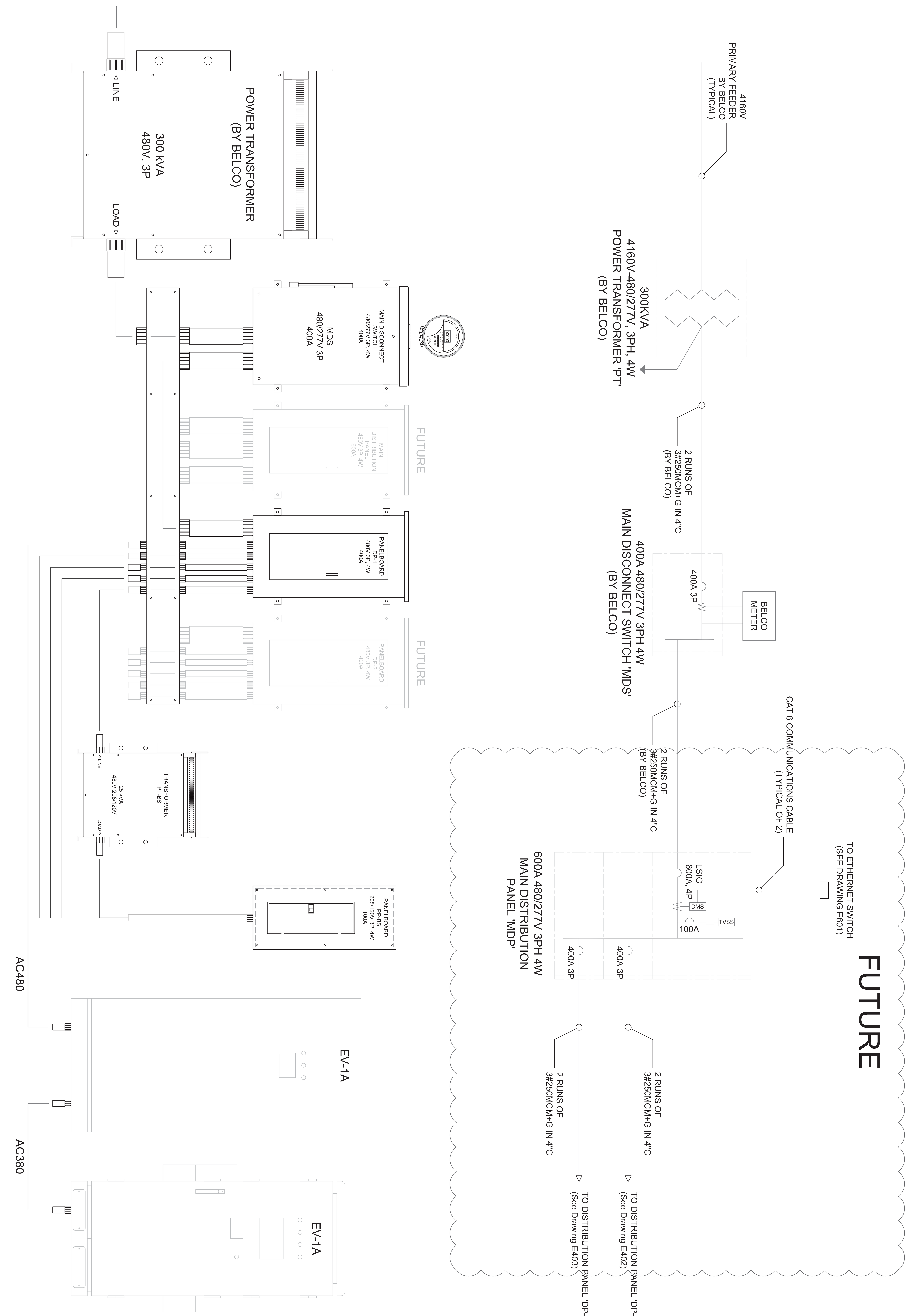
ISSUED FOR PERMIT

GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT
DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S

LEGEND, DRAWING LIST & GENERAL NOTES

PROJECT NO:	21033
DRAWN BY:	IAL
DATE:	AUGUST 2021
SCALE:	NTS

E100



GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT

DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S

480V MAIN DISTRIBUTION
SCHEMATIC DIAGRAM

PROJECT NO:	21033
DRAWN BY:	IAL
DATE:	AUGUST 2021
SCALE:	NTS

E401

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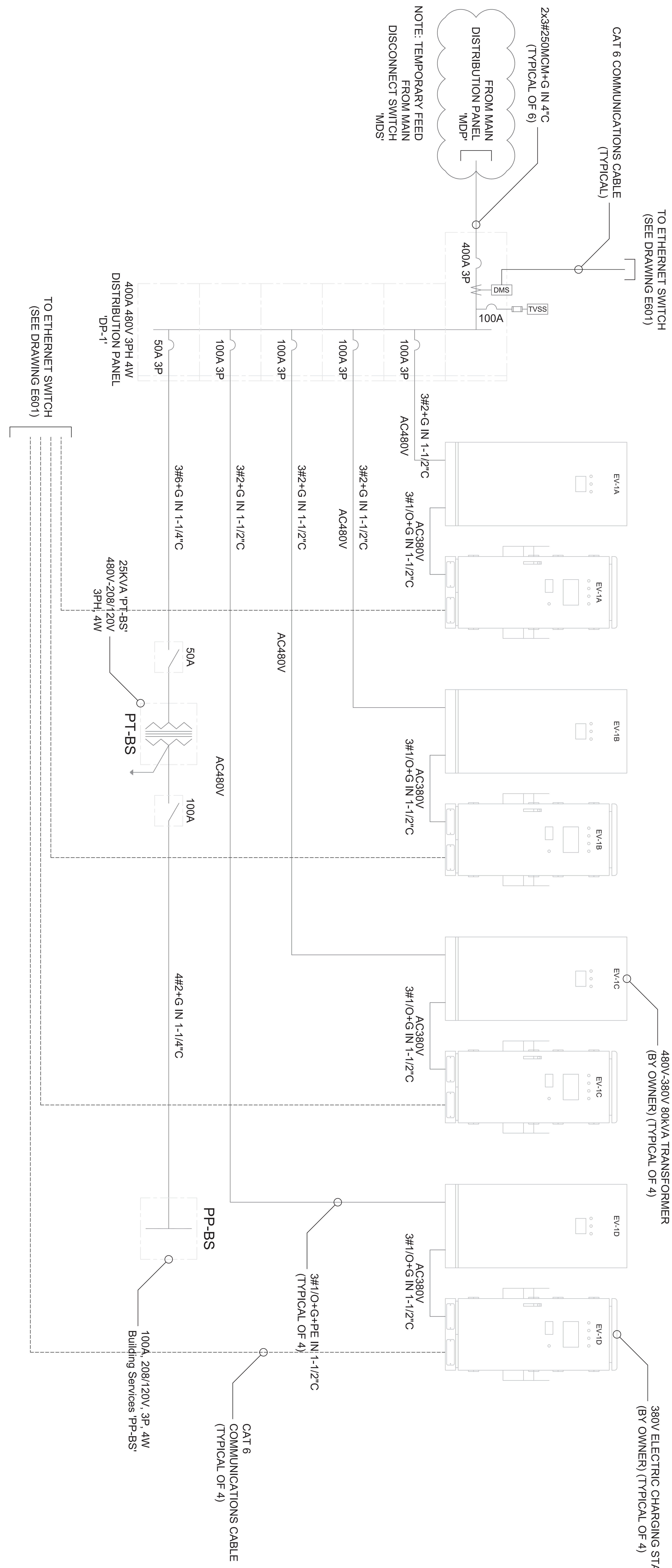
Tel: 441.505.1888 • email: ial@logic.bm

ISSUED FOR PERMIT

REGISTERED PROFESSIONAL ENGINEER
C. JAY O'CONNOR
No. 84
September 2021
BERMUDA

REV.#	REV. Date	REV. Notes



E402

GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT

DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S

480V DISTRIBUTION PANEL 1
SCHEMATIC

PROJECT NO:	21033
DRAWN BY:	IAL
DATE:	AUGUST 2021
SCALE:	NTS

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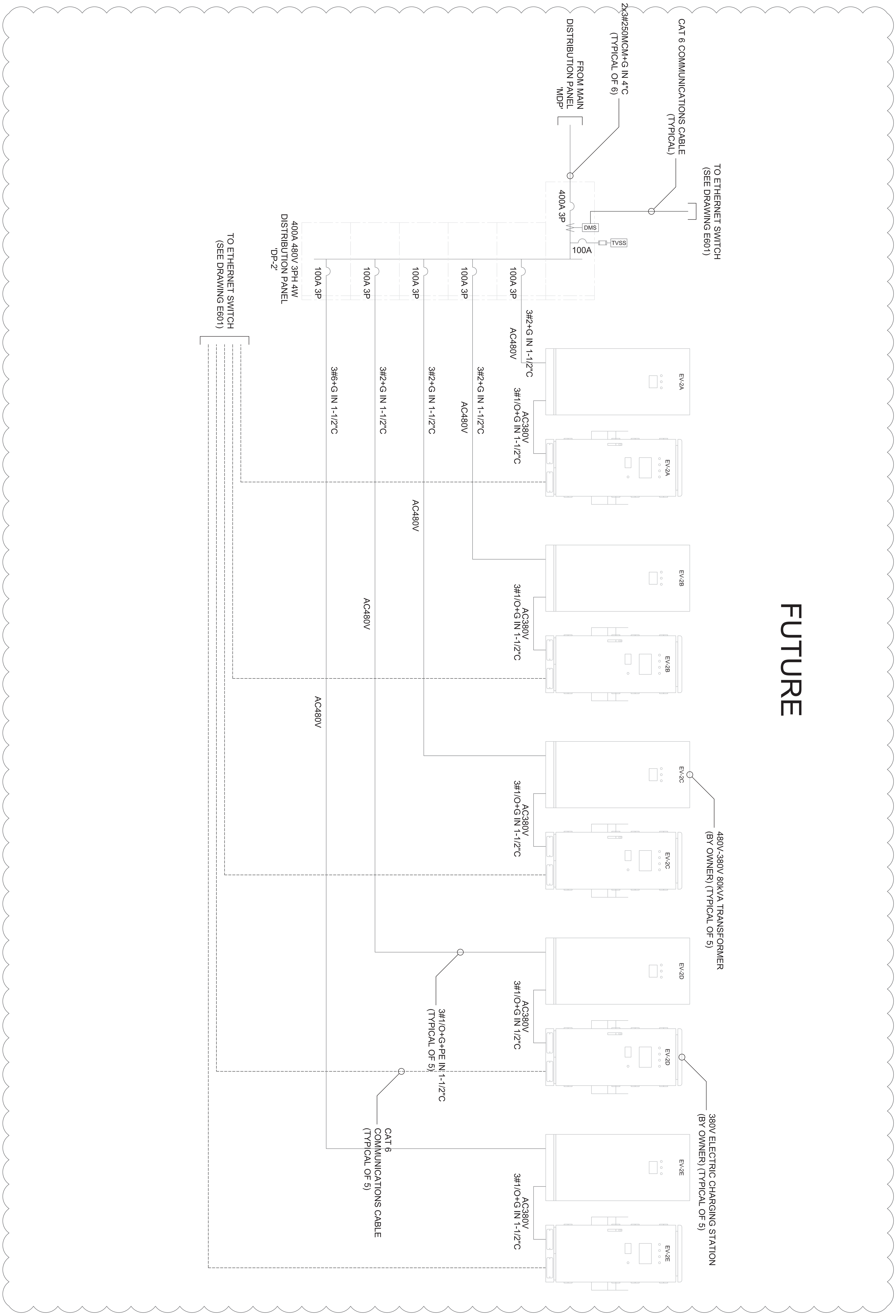
ISSUED FOR PERMIT

REGISTERED PROFESSIONAL ENGINEER — BERMUDA — C. JAY O'CONNOR — September 2021

REV.#	REV. Date	REV. Notes



GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT

DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S

480V DISTRIBUTION PANEL 2
SCHEMATIC

PROJECT NO:	21033
DRAWN BY:	IAL
DATE:	AUGUST 2021
SCALE:	NTS

E403

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ISSUED FOR PERMIT

REGISTERED PROFESSIONAL ENGINEER
BERMUDA
C. J. O'CONNOR
September 2021

REV.#	REV. Date	REV. Notes

POWER PANEL PP-BS
BUILDING SERVICES
SIEMENS P1
100A 208/120V 3P-4W

ELECTRIC SERVICE PANEL SCHEDULE

DESCRIPTION	BREAKERS POLE-AMP	No.	L1	L2	L3	No.	BREAKERS POLE-AMP	DESCRIPTION
AC UNIT CU-1	2P-30A	1	●			2	2P-20A	SPARE
		3		●		4		
LIGHTS EXTERIOR	1P-20A	5			●	6	1P-20A	RECP.
LIGHTS INTERIOR	1P-20A	7	●			8	1P-20A	RECP.
SPARE	1P-20A	9		●		10	1P-20A	RECP.
SPARE	1P-20A	11			●	12	1P-20A	RECP.
SPARE	1P-20A	13	●			14	1P-20A	RECP.
SPARE	1P-20A	15		●		16	1P-20A	RECP.
SPARE	1P-20A	17			●	18	1P-20A	RECP.
SPARE	1P-20A	13	●			20	1P-20A	RECP.
SECURITY	1P-20A	15		●		22	1P-20A	RECP.
FIRE ALARM PANEL	1P-20A	17			●	24	1P-20A	RECP.

DISTRIBUTION PANEL DP-1
EV CHARGING STATIONS
SIEMENS P2 M 18 FX 400 ABS
400A 480V 3P-4W

ELECTRIC SERVICE PANEL SCHEDULE

DESCRIPTION	BREAKERS POLE-AMP	No.	L1	L2	L3	No.	BREAKERS POLE-AMP	DESCRIPTION
CHARGING STATION EV-1A	3P-100A	1	●			2	3P-100A	CHARGING STATION EV-1B
		3		●		4		
		5			●	6		
CHARGING STATION EV-1C	3P-100A	7	●			8	3P-100A	CHARGING STATION EV-1D
		9		●		10		
		11			●	12		
FEED TO PP-BS via PT-BS	3P-50A	13	●			14	-	-
		15		●		16		
		17			●	18		

FUTURE

DISTRIBUTION PANEL DP-2
EV CHARGING STATIONS
SIEMENS P2 M 18 FX 400 ABS
400A 480V 3P-4W

ELECTRIC SERVICE PANEL SCHEDULE

DESCRIPTION	BREAKERS POLE-AMP	No.	L1	L2	L3	No.	BREAKERS POLE-AMP	DESCRIPTION
CHARGING STATION EV-2A	3P-100A	1	●			2	3P-100A	CHARGING STATION EV-2B
		3		●		4		
		5			●	6		
CHARGING STATION EV-2C	3P-100A	7	●			8	3P-100A	CHARGING STATION EV-2D
		9		●		10		
		11			●	12		
CHARGING STATION EV-2E	3P-100A	13	●			14	-	-
		15		●		16		
		17			●	18		

REV.# | REV. Date | REV. Notes

REGISTERED PROFESSIONAL ENGINEER – No. 87 – C. JAY O'CONNOR – September 2021 – BERMUDA

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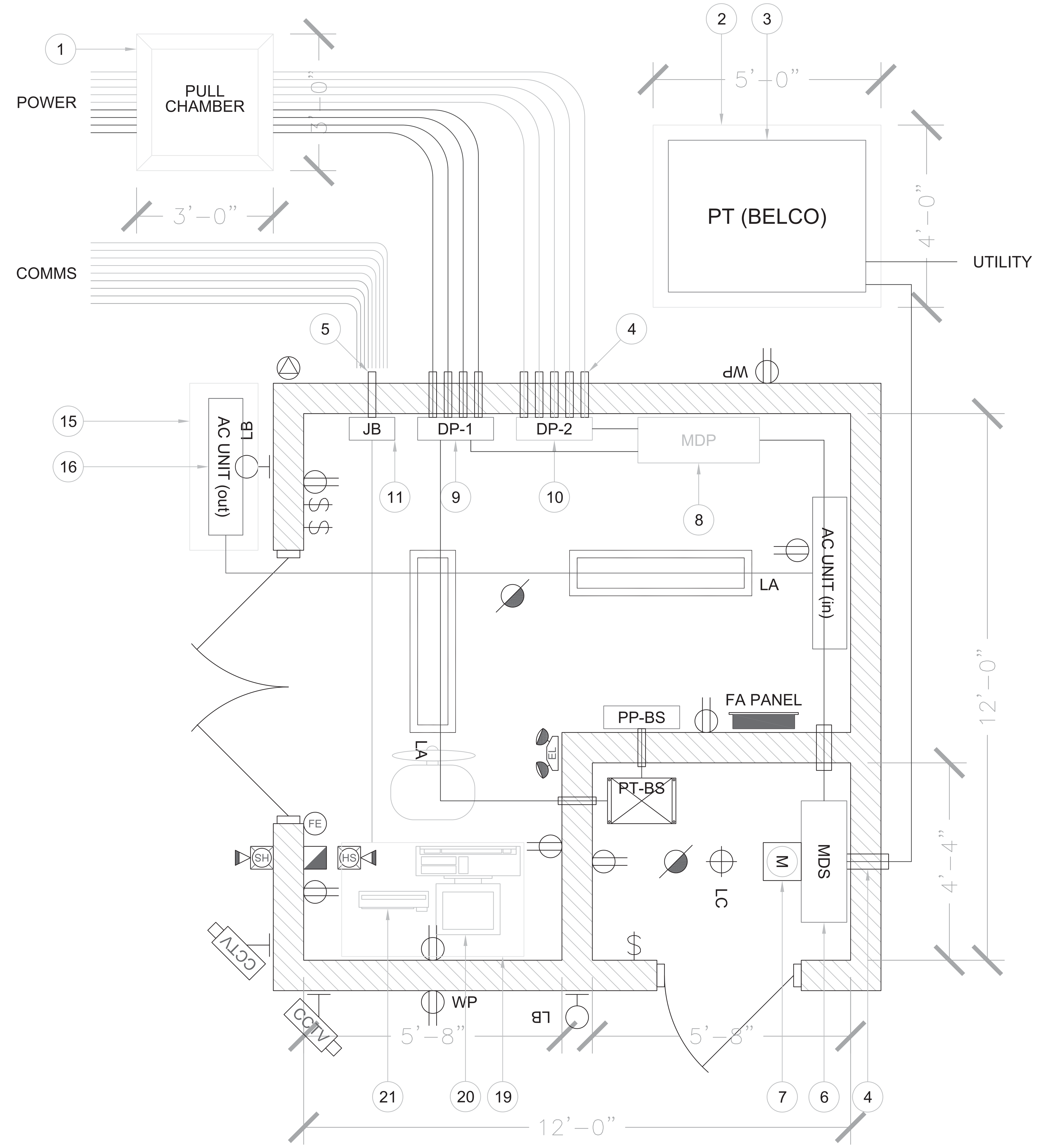
ISSUED FOR PERMIT

GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT
DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S
ELECTRIC PANEL SCHEDULE
DETAILS

PROJECT NO: 21033
DRAWN BY: IAL
DATE: AUGUST 2021
SCALE: NTS

E404



1 MAIN ELECTRICAL ROOM LAYOUT (OPTION A) N.T.S

LEGEND

ITEM No.	DESCRIPTION
1	3' X 3' PULL CHAMBER
2	4" HIGH CONCRETE HOUSEKEEPING PAD
3	300KVA 4160V-480V 3-PHASE POWER TRANSFORMER (BY BELCO)
4	1X2" PVC SLEEVE (TYPICAL)
5	2X4" PVC SLEEVE (TYPICAL)
6	400A 3-PHASE MAIN DISCONNECT SWITCH 'MDS' (BY BELCO)
7	BELCO METERING EQUIPMENT (TYPICAL)
8	600A MAIN DISTRIBUTION PANEL 'MDP' (FUTURE)
9	400A 3-PHASE DISTRIBUTION PANEL 'DP-1' FOR CHARGING STATIONS EV-1 TO EV4
10	400A 3-PHASE DISTRIBUTION PANEL 'DP-2' (FUTURE) FOR CHARGING STATIONS EV-5 TO EV-9
11	12" X 12" X 8" PVC JUNCTION BOX (FOR COMMS CABLING)
12	15KVA 480V-120/240V 1-PHASE POWER TRANSFORMER 'PT-BS' (FOR BIULDING SERVICES)
13	100A 120/240V 1-PHASE DISTRIBUTION PANEL 'PP-BS' (FOR BUILDING SERVICES)
14	FIRE ALARM PANEL
15	4" HIGH CONCRETE HOUSEKEEPING PAD
16	SPLIT SYSTEM AIR CONDITIONING UNIT
17	PLYWOOD BACKBOARD (TYPICAL)
18	NETWORK CABINET
19	DESK & CHAIR
20	PC FOR CHARGE MANAGEMENT SOFTWARE
21	ETHERNET SWITCH & PRINTER
22	4" HIGH CONCRETE HOUSEKEEPING PAD
23	80kVA TRANSFORMER(S) 480-380V (TYPICAL)

REV.#	REV. Date	REV. Notes

REGISTERED PROFESSIONAL ENGINEER
No. 87
C. JAY O'CONNOR
September 2021
BERMUDA

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ISSUED FOR PERMIT

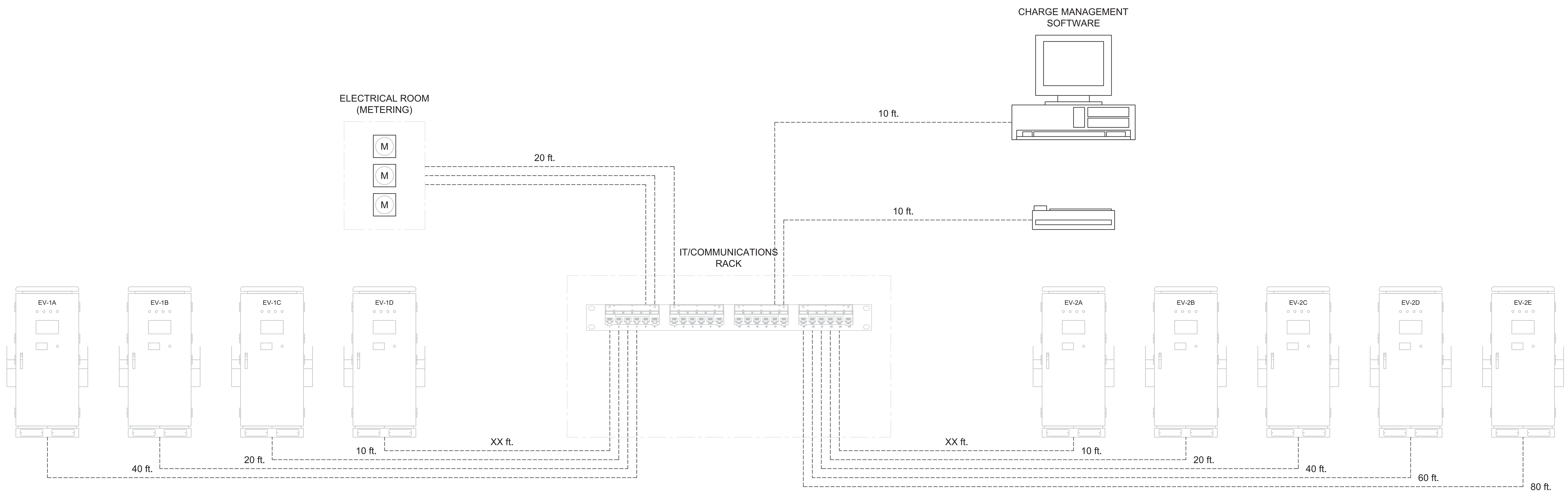
GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT

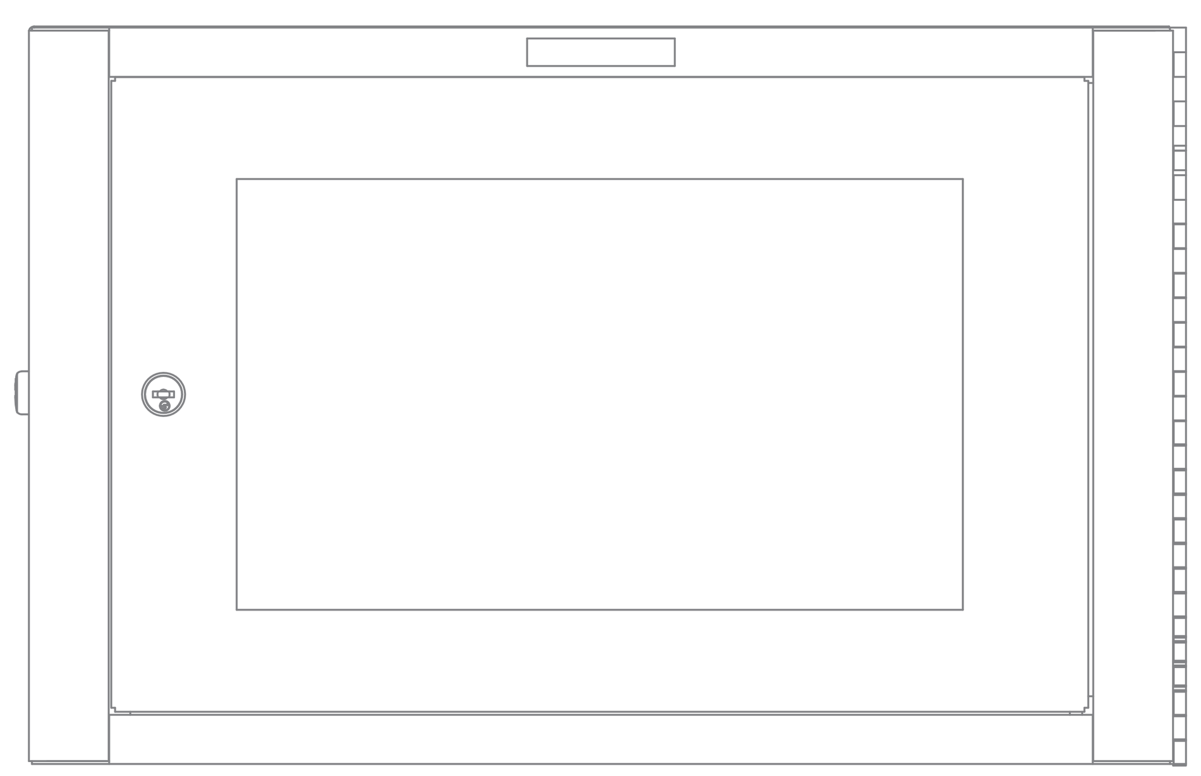
DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S

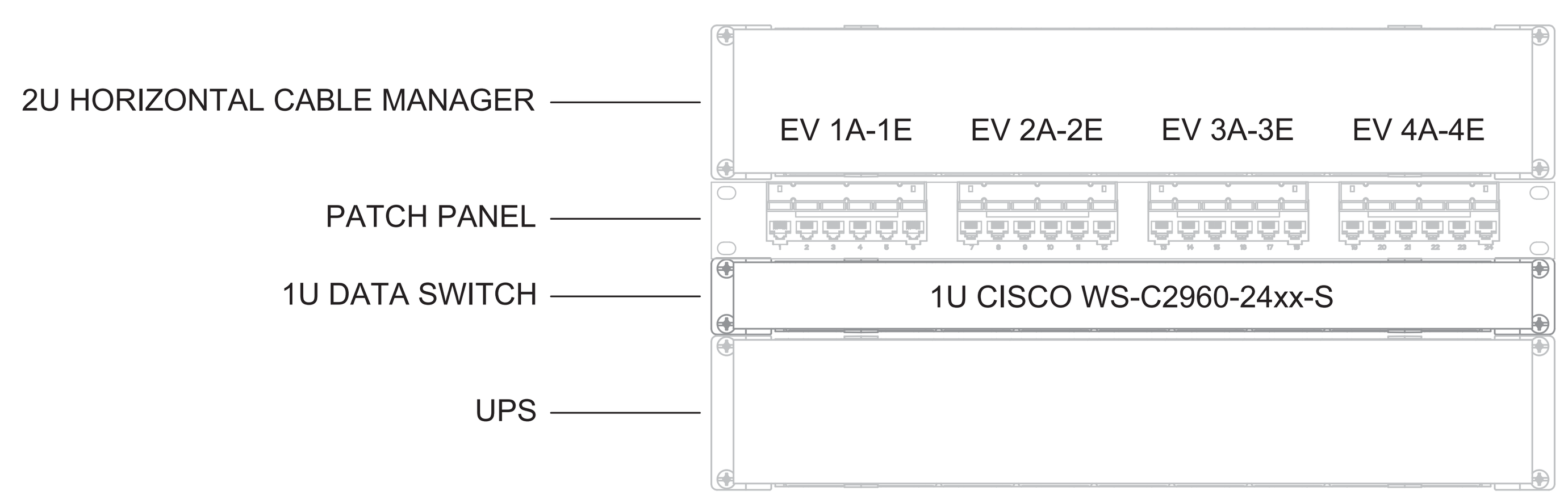
ELECTRICAL ROOM
LAYOUT (OPTION A)

PROJECT NO:	21033
DRAWN BY:	IAL
DATE:	AUGUST 2021
SCALE:	NTS

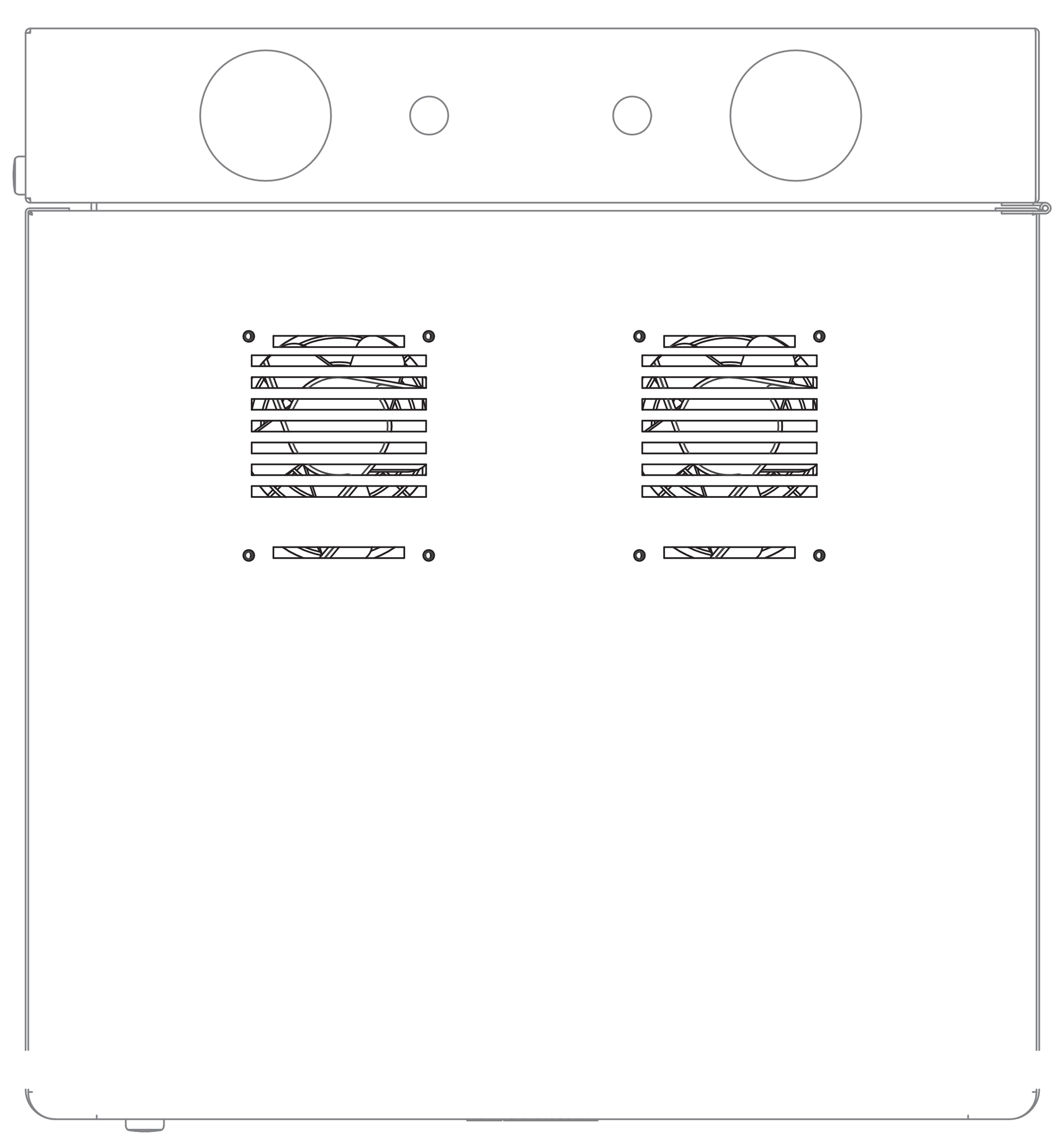
E501







1x PDU Power Strip
Horizontal, Surge,
20A, Twistlock plug



WALL MOUNT CABINET 6RU
LIGHT DUTY SERIES FRONT DOOR

PLEXIGLASS SIDE PANELS
VENTED TOP AND BOTTOM PANELS
2 FAN

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GOVERNMENT OF BERMUDA
ST. GEORGE'S BUS DEPOT

DEPARTMENT OF PUBLIC TRANSPORT
OLD MILITARY ROAD, ST. GEORGE'S

COMMUNICATIONS SCHEMATIC DIAGRAM

PROJECT NO:	21033
DRAWN BY:	IAL
DATE:	AUGUST 2021
SCALE:	NTS

E601