N233 Electrical Renovation

Construction Phasing Plan

Baseline Plan

March 19, 2010

NASA Ames Research Center

Introduction to Phasing Plan

- General
  - Building N233 provides critical IT & communications functions on a 24x 7 basis for daily operation of the Center and critical scientific projects
  - Minimization of building outages and risk mitigation are critical throughout this project
- Purpose of Phasing Plan
  - Serve as guideline for management of construction in discrete increments
  - Describe transition to temporary power and transition to new system in clear steps
  - Ensure IT Service outages are minimized and carefully managed
  - Mitigate risk to project
  - Note: This plan is not intended to be the detailed "work plan" to prepared by the Contractor.
- Summary
  - Construction is accomplished in 16 phases with 10 building outages
  - Multiple temporary power sources are required to mitigate risk - See the Appendix to this document for illustration of the temporary power implementation
  - This Phasing Plan is based on the approved construction drawings
  - This Phasing Plan includes the Base Bid, Additive #1 and Additive #2.
  - Phasing Plan diagrams are simplified for illustration and are not to scale
  - ***The Contractor is free to propose a more effective phasing for NASA approval***

Introduction to Phasing Plan (cont.)

- **Construction Requirements and Constraints**
  - Building N233 provides critical functions on a 7x24 basis required for daily operation of the Center, therefore, power outages must be minimized and carefully managed.
  - Power outages must be coordinated with the Gov. and prior notification at least 3 weeks in advance is required. Gov. approval for each outage is required.
  - Building-wide outages of Computer Power and/or Building Power must be planned for Saturdays to avoid disruption of critical IT services to the Center during business hours. (The Gov. requires Sunday for restoration of IT services.)
  - The contractor shall prepare a detailed work plan prior to any and all power shutdowns or cutovers for Gov. approval two weeks prior to the scheduled event. The plan will describe the detailed steps in cutover of each circuit showing how and where the existing circuit will be intercepted and reconnected to the new supply. In addition, the time estimated for the cutover of each circuit will be provided. The plan will include an overall timeline summarizing the cutover of all circuits and any other tasks planned for the specific event and the level of staffing to be provided for the cutover. The Gov. in its review will examine the plan for overall reasonableness of the timeline vs the allocated time for the cutover and the staffing resources proposed.

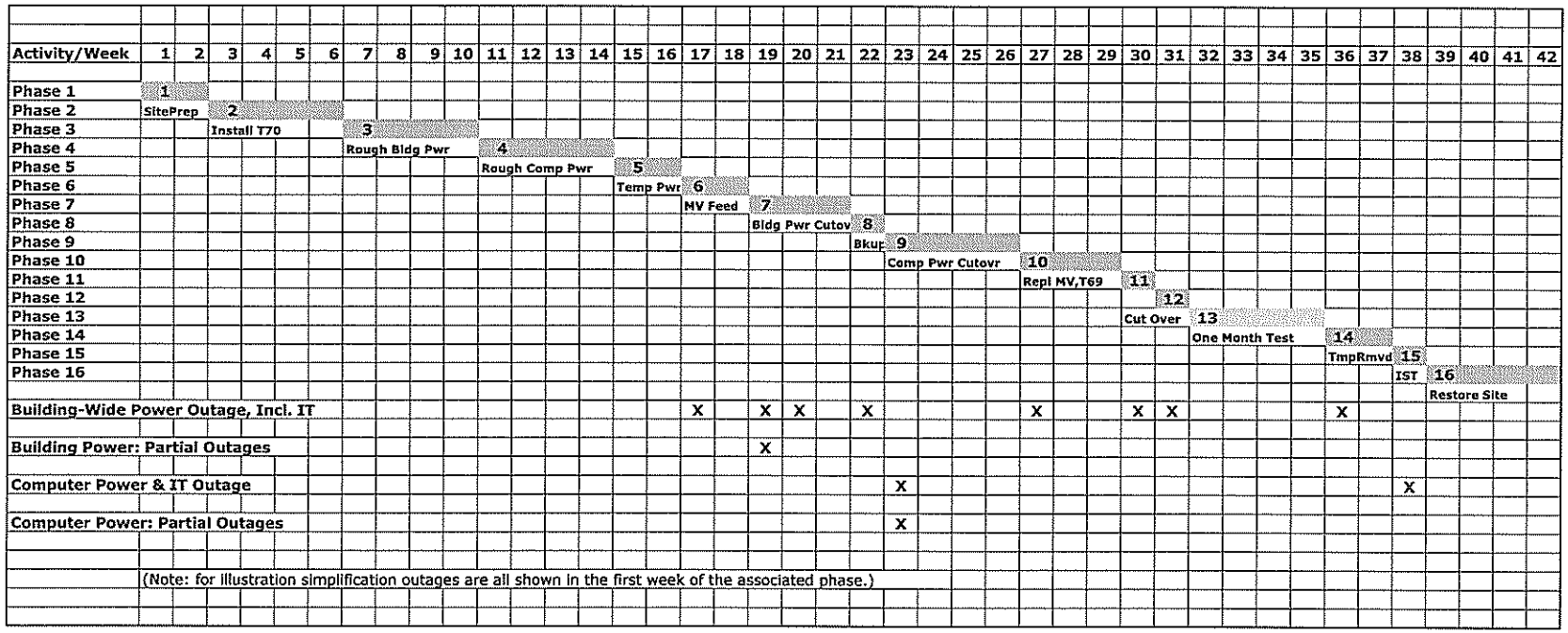
Introduction to Phasing Plan (cont.)

- **Construction Requirements and Constraints (cont.)**
  - Work in computer rooms must be coordinated with the Gov. to ensure non-interference with 24x7 computer operations. The contractor is required to provide barriers surrounding work areas for protection of Gov. personnel and operating computer equipment. The contractor is required to clean up debris, scrap, and loose parts at the end of each work day and vacuum clean the work area in the computer room. Physical access to computer rooms is restricted, requiring the contractor to plan for and identify those workers who will require electronic card access to the rooms where work is to be performed.
  - The contractor is responsible for the reconnection and restoration of all circuits affected by this modification to provide a fully functional system.
  - The contractor shall provide a mobile generator for emergency backup power for the entire building for the duration of of the construction
  - Testing of the new Emergency Power Off (EPO) controls and the new Ground Fault Detector equipment will be based on Test Plans developed by the Gov. The contractor will perform the tests as defined in the plans. The Government will monitor and approve the test results.

Outline of Construction Phases

Phase	Description	Building Outage	Est. Phase Duration (wks)
1.	Site Preparation	None	2
2.	Place New Equipment (T70 and distribution panels)	None	4
3.	Rough-In Building Power Circuits	None	4
4.	Rough-In Computer Power Circuits and EPO Cntrls	None	4
5.	Install Temporary Power Circuits and Mobile Generator	None	2
6.	Install New MV Feeder and Energize New T70 & T70-1	1 N233	2
7.	Cutover Building Power Loads	2 N233	3
8.	Install Backup Temp Computer Power	1 N233A	1
9.	Cutover Computer Power Loads	1 N233	4
10.	Replace Existing Substations and MV Switchgear	1 N233	3
11.	Energize and Test New MV System	1 N233	1
12.	Cutover to New System	1 N233	1
13.	One-Month Operational Use Period	None	4
14.	Remove Temporary Power Sources	1 N233	2
15.	Integrated System Test: EPO, GFD, MVATS	1 N233	1
16.	Restore Site	None	4
		9 N233	**42 wks**
		1 N233A	

Expected Construction Timeline



List of Abbreviations

AHU	Air Handler Unit (AHU-31 in rm B10, AHU-41 in ceiling space in corridor near rm E104)
CHA	Distribution panel for chillers, in room B13 N233 basement
CT-MCC	Motor Control Center panel for cooling towers, in room B13 N233 basement
DPA	Distribution sub-panel for 208V Computer Power, in room B13 N233 basement
DPAA	Distribution main-panel for 480V Computer Power, in room B13 N233 basement
DPB	Distribution sub-panel for 480V Building Power, in room B13 N233 basement
DPBB	Distribution main-panel for 480V Building Power, in room B13 N233 basement
DP3	Distribution panel for T182, located in N233A basement, source for backup computer power
EPO	Emergency Power Off
EPOCP-1	Emergency Power Off Control Panel -1, in room 170
EPOCP-2	Emergency Power Off Control Panel -2, in room 150
FACP	Fire Alarm Control Panel
FCU	Fan Coil Unit (FCU-1, FCU-2, FCU-3 are located in ceiling space above room 155 and powered from MCC-1)
GFD	Medium voltage (13.8KV) Ground Fault Detector, at the generator site
ISU	Computer room In-Space cooling Unit, (ISU#16 is Gov Furnished Equip. in rm B1 in N233 basement)
MBG	Main Building Ground terminal block, in room B13 N233 basement
MCG	Main Computer Ground terminal block, in room B13 N233 basement
MCC-B	Motor Control Center-B, in room B13 N233 basement
MCC-1	Motor Control Center-1, in room M101 first floor mechanical room
MCC-C	Motor Control Center-C, in room 227A N233 second floor
MV	Medium Voltage (13.8KV), (utility power to N233 building)
MVATS	Medium Voltage Automatic Transfer Switch, at the generator site
N233	Central Computer Facility building - site of project
N233A	Adjoining building, Advanced Computational Facility
T69	Substation for Building Power (13.8KV-to-480V), in room B13 N233 basement
T70	Substation for Computer Power (13.8KV-to-480V), in room B13 N233 basement
T70-1	Step-down transformer (480V-to-208V) for Computer Power, in room B13 N233 basement
PDU	Power Distribution Unit used for Computer Power (PDU-1 in rm. 150, PDU-2 in rm 165, new PDU-3 in rm. 165)
UPS	Uninterruptible Power System (UPS-1 in rm 150, UPS-2 in rm B10, and new UPS-3 in rm B1)
VCB	Medium voltage Vacuum Circuit Breaker

Construction Phases - Brief Description

- **1. Site Preparation**
  - Mechanical demolition of piping, abandoned air ducts, removal of B13 doorway and louvers
  - Install concrete pads for new T70, T70-1, DPAA, DPA, DPBB, DPB, CHA and CT-MCC
  - Install new main electrical grounding points.
  - Remove designated light fixtures in rooms B10 and B13
  - Relocate drain pipes and reconfigure fire sprinkler piping
  - At MH150, pull back un-used generator control cable to clear duct. Verify duct is clear for new MV feeder cable to be installed in later phase
  - Additive #1: Install concrete pad for GFD cabinet and install MVATS Heat Shield
  - Additive #2: Modify entrance door to room B1, remove existing air duct, and install concrete equipment pads

- **2. Place New Equipment (T70 and distribution panels)**
  - Place T70, DPAA, T70-1, DPA and install interconnecting buses and grounds
  - Place DPBB, DPB, CHA, CT-MCC and install interconnecting buses and grounds
  - Place temporary VCB adjacent to DPAA
  - Conduct Inspection and pre-energization tests, including Hi-Pot, of all new equipment
  - Enlarge MV PB#2 to accept additional MV feeder and deadbreak connectors
  - Additive #1: Place new GFD cabinet on new pad at generator site
  - Additive #2: Place UPS#3, batteries, and ISU#16 on pads in room B1
  - Additive #2: Install CW & CD piping, air duct, and electrical power to ISU#16 and test

Construction Phases - Brief Description

- **3. Rough-In Building Power Circuits**
  - Install conduits, pull boxes & cables to construct new circuits to prepare for interception and cut over of existing branch circuits and loads.
  - Install circuits for shunt-trips in DPBB, DPB
  - Install all electrical grounds
  - Test all new circuits and connections at new panel boards, includes Hi Pot
  - Additive #1: Install and wire GFD components, test and ready for MV connection

- **4. Rough-In Computer Power Circuits and EPO Controls**
  - Install conduits, pull boxes & cables from DPAA to UPS#2 in preparation for cutover
  - Install conduits, pull boxes & cables from DPA to prepare for cutover of computer power loads in rooms 150, 155, 160, 165, and 170
  - Install conduits, pull boxes & cables for panels PDC-1 and P3100
  - Install new circuits in rooms 165 and 170 to migrate loads from Panels 1100 and 1200
  - Install shunt-trip circuits for DPAA and DPA
  - Install computer power grounds
  - Test all new circuits and connections at new panel boards, includes Hi Pot
  - Remove old EPO control buttons in rooms 150, 155, 160, 165, 170
  - Install new EPO control panels, buttons, beacons etc. in rooms 150, 151,165, 170, & B1
  - Test new EPO controls for correct logical operation and shunt-trips in new panels
  - Install EPO control circuits for existing UPS#1, UPS#2, and HVAC equip. (cut over later)
  - Additive #2: Install UPS #3 supply circuit from DPAA and output circuit to PDU#3
  - Additive #2: Install PDU #3 in room 165 with power source from UPS#3
  - Additive #2: Install EPO button in room B1 and EPO control for UPS#3

Construction Phases - Brief Description

- **5. Install Temporary Power Circuits and Mobile Generator**
  - Rough-in temporary MV circuit from temporary VCB to MV PB#2 for later cutover
  - Install temporary MV circuit from T70 to temporary VCB
  - Install temporary circuit from DPAA to DPBB
  - Test all new MV and 480 volt circuits and connections, includes Hi Pot
  - Test Temporary MV VCB
  - Install mobile generator for backup power, connect to DPBB, and test

- **6. Install New MV Feeder and Energize New T70 & T70-1** *Outage*
  - Pull in new MV feeder cable from M150 to N233 and perform Hi-Pot test
  - During N233 outage pull in remainder of new MV feeder from MH150 to MVATS, perform HI-Pot tests, and secure cable un-terminated
  - During N233 outage install Dead-Break connectors on existing MV feeder at MVPB#2 and connect existing system and new temporary VCB circuit.
  - During N233 outage test MV circuits and the temporary VCB prior to energizing.
  - Re-energize existing MV feeder and existing substations
  - Energize new VCB and T70/T70-1 and burn-in for at least one week
  - Energize DPAA, DPA, DPBB, DPB, CHA, and CT-MCC panels
  - Additive #2: Energize and test new UPS#3 and PDU#3 according to specifications

Construction Phases - Brief Description

- **7. Cutover Building Power Loads** *2 Outages*
  - During 2 ea. N233 outages cutover critical loads in accordance to a detailed migration plan developed by Contractor and NASA
  - During partial outages complete cutover of remaining loads according to detailed migration plan developed by Contractor and NASA
  - Additive #1: During outage connect new GFD equipment at MVATS and test

- **8. Install Backup Temp. Computer Power** *Outage*
  - During N233A outage replace the 480 volt circuit from N233A DP3 to Chaseway pull box PB-3A according to drawings.
  - Remove transfer switch at PB-1A/2A in Chaseway
  - Extend the N233A circuit from PB-3A to DPAA
  - Test new cable, verify phase rotation, energize then isolate and secure for future use

- **9. Cutover Computer Power Loads** *Outage*
  - During N233 outage cutover UPS#1 and UPS#2 to new sources
  - During N233 outage cutover P1100 and P1200 computer loads to new PDU#3 (or alternative) in accordance to detailed migration plan developed by Contractor and NASA
  - During partial outages cut over PDC-1, P9 &10, P2900, P245A, P3100 according to detailed migration plan developed by Contractor and NASA
  - Replace panels P800, P1100, P1200
  - During partial outage cut over panel PC to new supply from P800

Facility is now operating on new system with temporary power

Construction Phases - Brief Description

- **10. Replace Existing MV Substations** *Outage*
  - During N233 outage disconnect existing MV switchgear from existing MV feeder to isolate equipment to be demolished. Existing MV feeder remains energized to power new T70
  - Demolish old MV switchgear, T69, T70 and associated distribution panels
  - Install concrete equipment pads with grounds for new MV equipment, new T69, and DPBB main breaker
  - Place and connect new MV switchgear and new T69, and DPBB main breaker
  - Perform pre-energization tests on MV protective relays and new VCB's
  - Rough-in bus to link DPBB main breaker to the DPBB panel
  - Rough-in permanent MV circuit to supply T70
  - Test all new cables and terminations
  - Re-install light fixtures in rooms B10 and B13
- **11. Energize and Test New MV System** *Outage*
  - During N233 outage terminate the new MV feeder at the new MV switch gear VCB 404 and terminate at MVATS output. Note that original/existing feeder also remains connected at the MVATS to supply temporary power
  - Energize MV feeders and test the new MV protective relays and new T69
  - Burn-in new equipment for one week

Construction Phases - Brief Description

- **12. Cutover to New System** *Outage*
  - During N233 outage cutover the new DPBB main breaker bus to the DPBB panel
  - During N233 outage disconnect and isolate temporary MV circuit to T70
  - During N233 outage connect permanent MV feeder to T70
  - During N233 outage disconnect and secure old MV feeder at MVATS
  - Energize new system via new permanent MV feeder

- **13. One-Month Operational Use Period**
  - Operate facility on new electrical system for a period of 4 weeks to demonstrate stability of new equipment under normal load conditions

- **14. Remove Temporary Power Sources** *Outage*
  - During N233 outage disconnect and remove temporary MV circuits for T70 and the temporary VCB. Relocate Temp. VCB to MV switchgear line-up for spare
  - During N233 outage pull out entire old MV feeder
  - During N233 outage disconnect mobile generator and remove from site
  - During N233 outage disconnect DPAA-to-DPBB temporary circuit
  - Re-install generator control cable from MH150 to N233 basement

Construction Phases - Brief Description

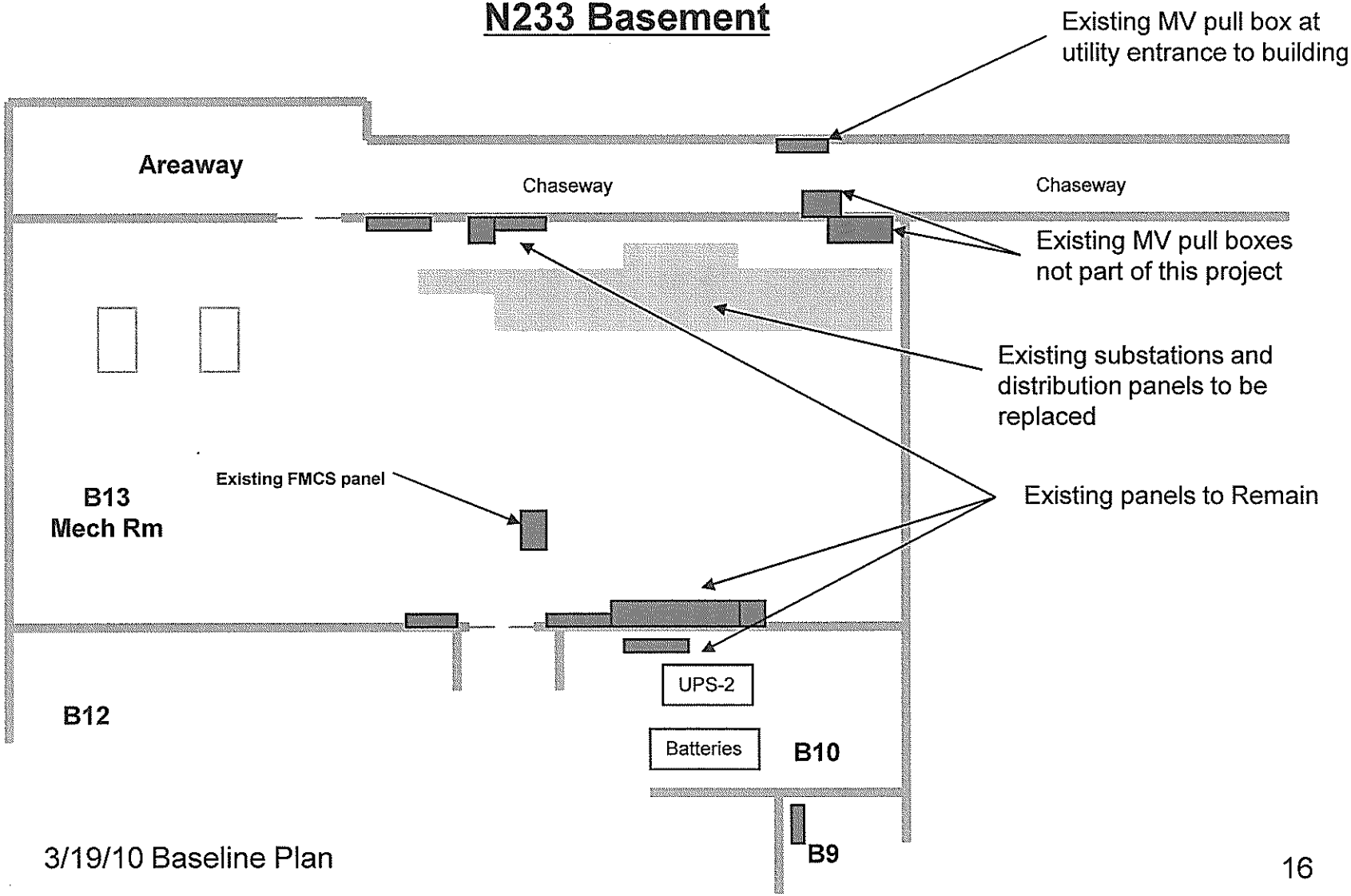
- **15. Integrated System Test: EPO, GFD, & MVATS** *Outage*
  - During N233 outage cutover EPO control circuits to UPS systems and air handlers
  - During N233 outage test new EPO controls for correct operation with computer power and HVAC systems. Include test with building fire alarm panel.
  - During N233 outage conduct test to verify operation of new GFD
  - During N233 outage test MVATS/Generator operation on loss of utility power

- **16. Restore Site**
  - Remove abandoned panels, pull boxes, cables
  - Remove UPS#2 step up transformer
  - Remove old transformer for panel PC
  - Seal all penetrations with fire-rated sealant
  - Clean up site
  - Label all new equipment, panels, breakers and circuits
  - Complete all "punch list" items
  - Deliver "AS-BUILT" drawings, equipment manuals, test data, warranties
  - Provide manufacturer training were required

Construction Phasing Illustrations

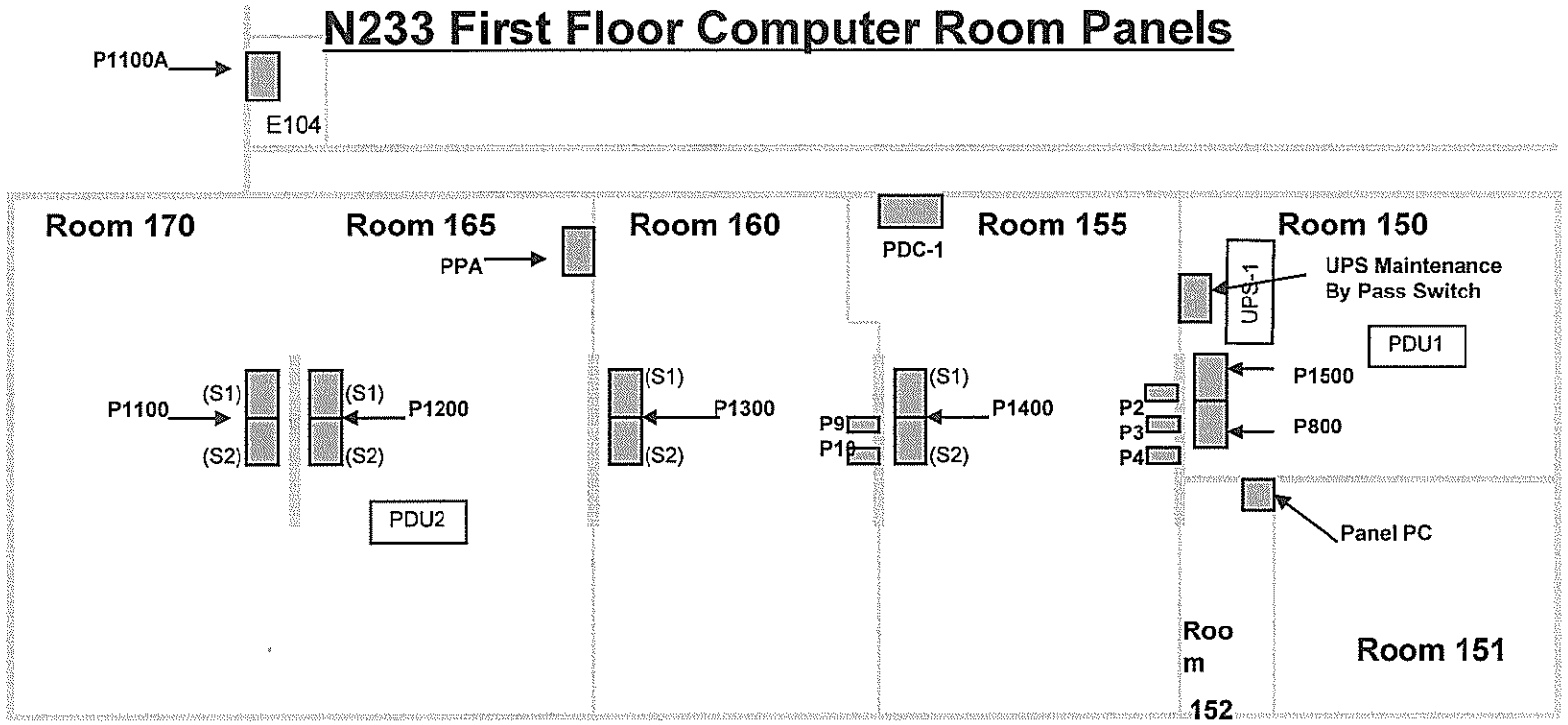
N233 Existing Equipment Layout

N233 Basement



N233 Existing Equipment Layout

N233 First Floor Computer Room Panels



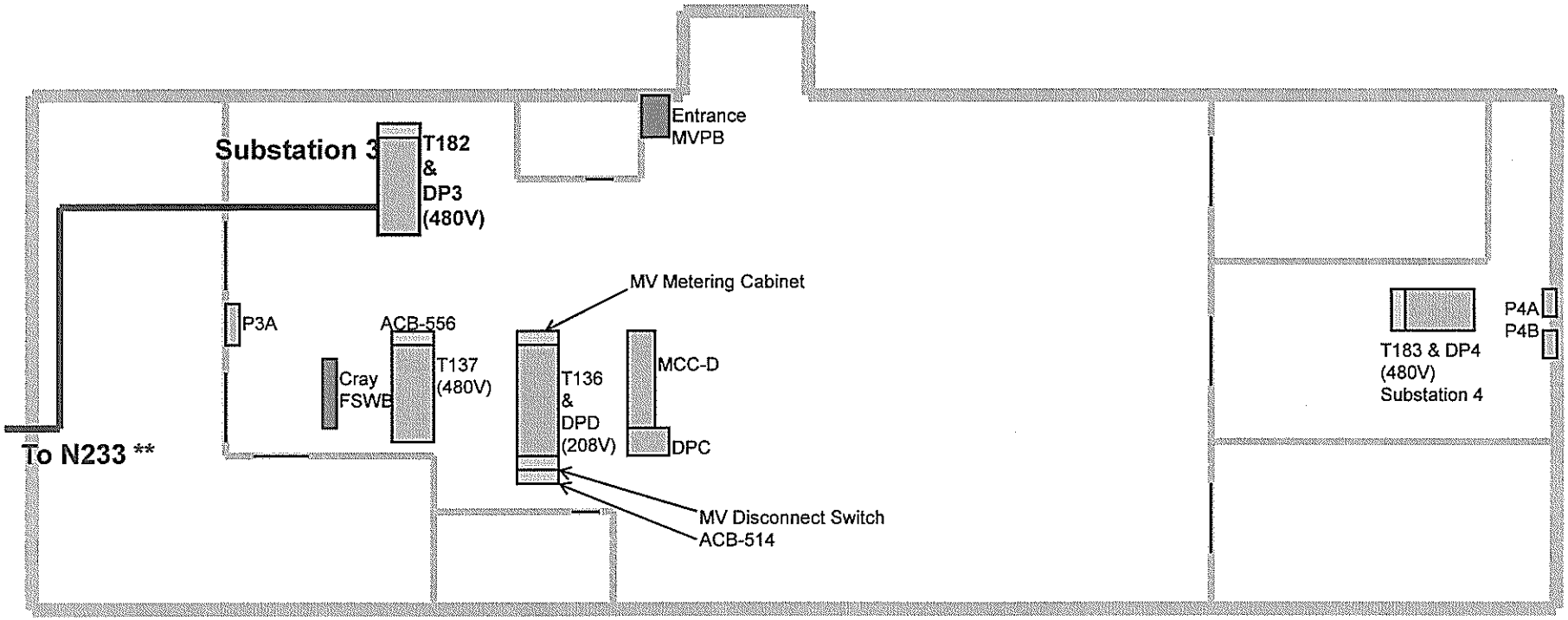
Gray indicates existing electrical panels
Rooms 150 thru 170 have computer raised access floors
Emergency Power Off controls are not shown

NOTES:

RM 170: P1100 Sections 1 & 2, 208V computer power, no active loads
RM 165: P1200 Sections 1 & 2, 208V computer power, no active loads
RM 165: PDU-165 supplies all IT equip. in Rm 165 and 170. PDU-165 is fed from UPS-2 in B10
Rm 165: PPA supplies 480V Bldg. Pwr to In-Space cooling Units (ISU's) in Rms 150, 165, & 170
RM 160: P1300 Section 1, is empty, used as path for circuits to 2nd floor panels P2900(208V) and P227A(480V)
RM 160: P1300 Section 2, 208V computer power, no active loads
RM 155: P1400 Sections 1 & 2 empty, used as path for feed to panels P9&10(208V), and feed to 2nd floor P245A(208V)
RM 155: PDC-1(208V) supplies panels P2, 3, & 4
RM 150: Maintenance Bypass Switch Panel feeds UPS-1, which feeds PDU-150.
RM 150: P1500 serves as pull box for 208V computer power to UPS Maint By Pass Sw.
RM 150: P800 not in service
RM 152: Panel PC(208V) is fed from ceiling mounted transformer supplied from PDC-3(480V).
RM E104: P1100A is fed from P1100, 208V computer power. P1100A has no active loads

N233A Existing Equipment Layout

N233A Basement



NOTES:

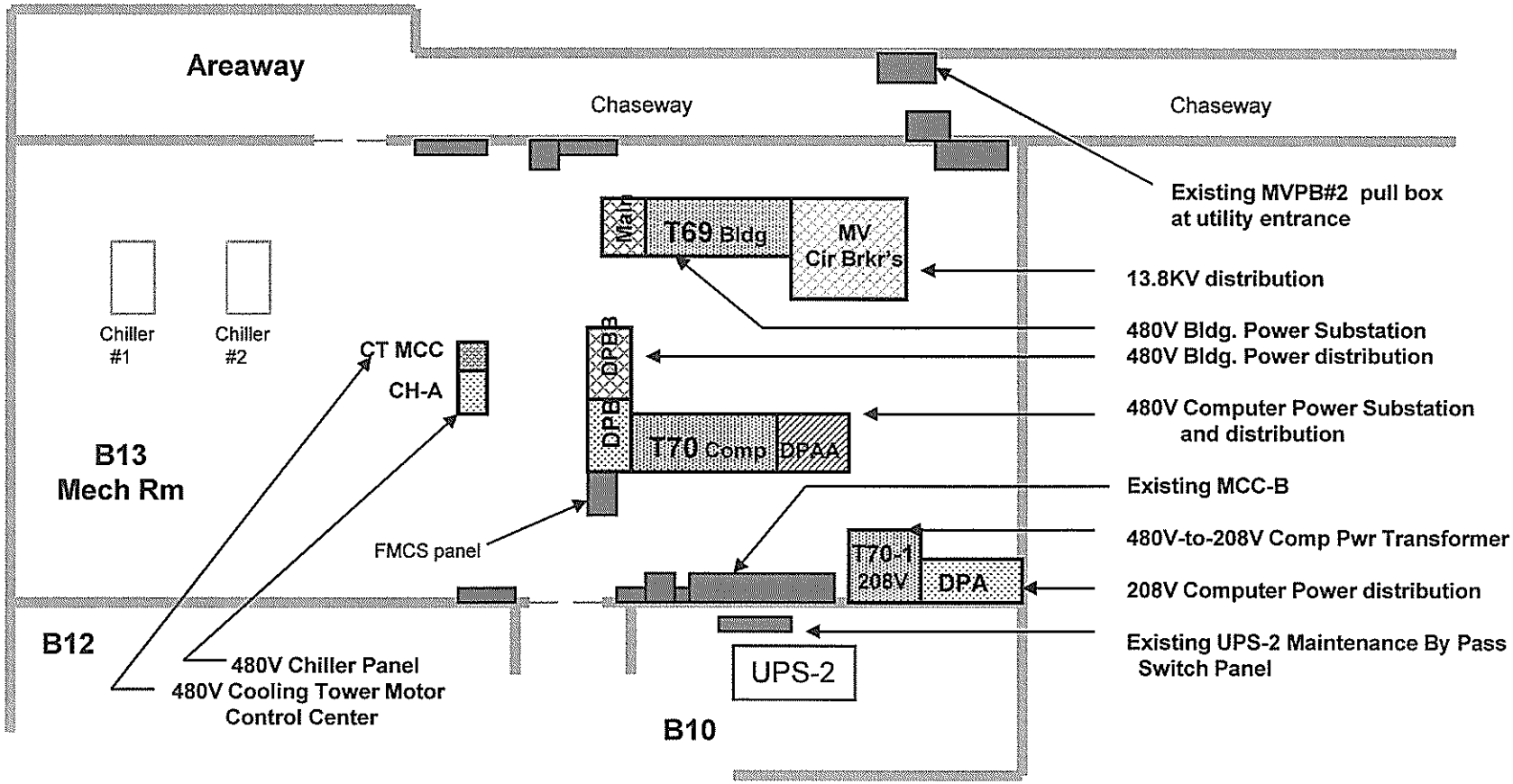
Existing equipment is shown in gray

▭ Indicates existing Medium Voltage (13.8KV) cabinets

** **Existing circuit to N233 Chaseway and Room M101. Circuit to be used for backup temporary power**

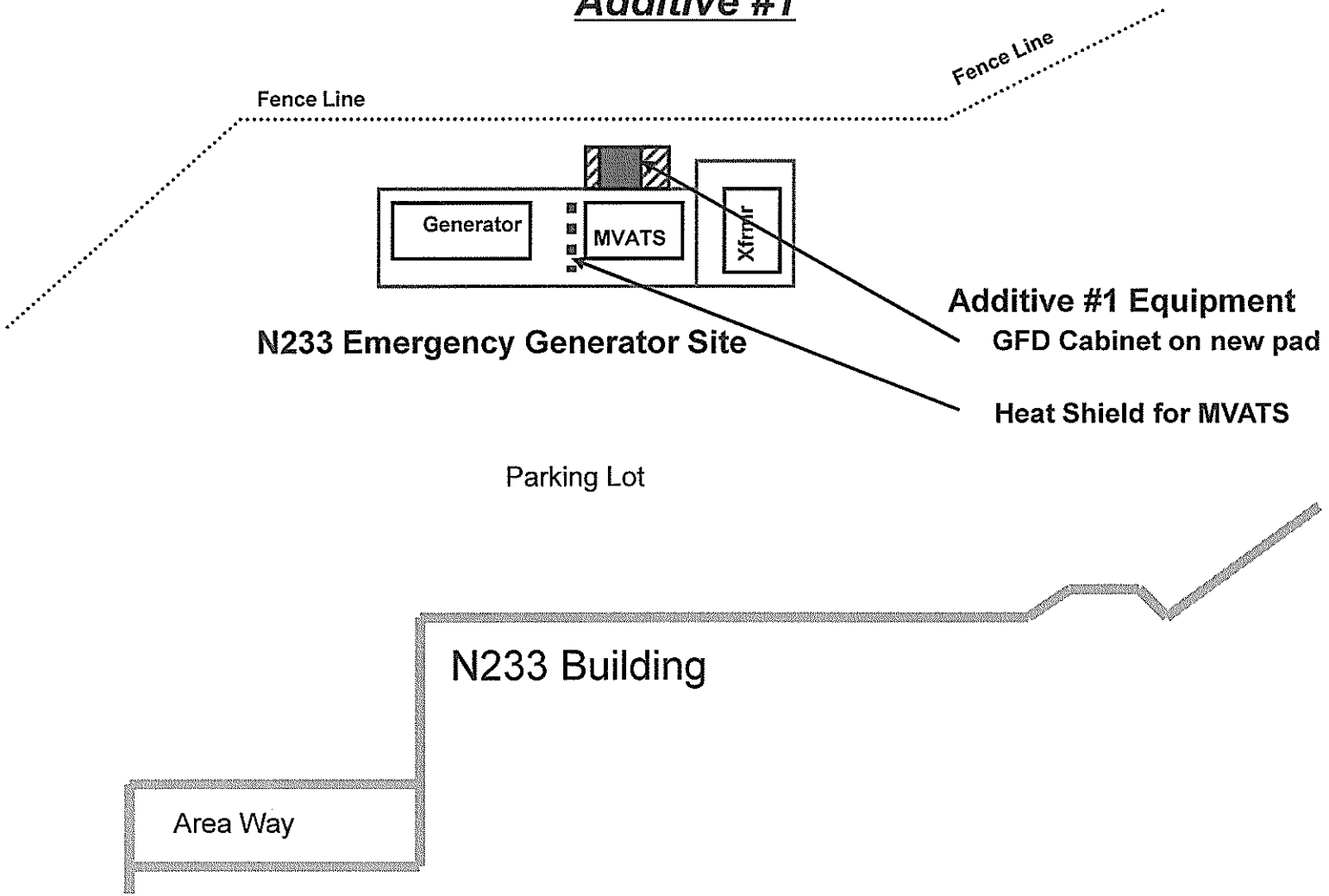
N233 New Equipment Layout

N233 Basement - Partial



N233 New Equipment Layout

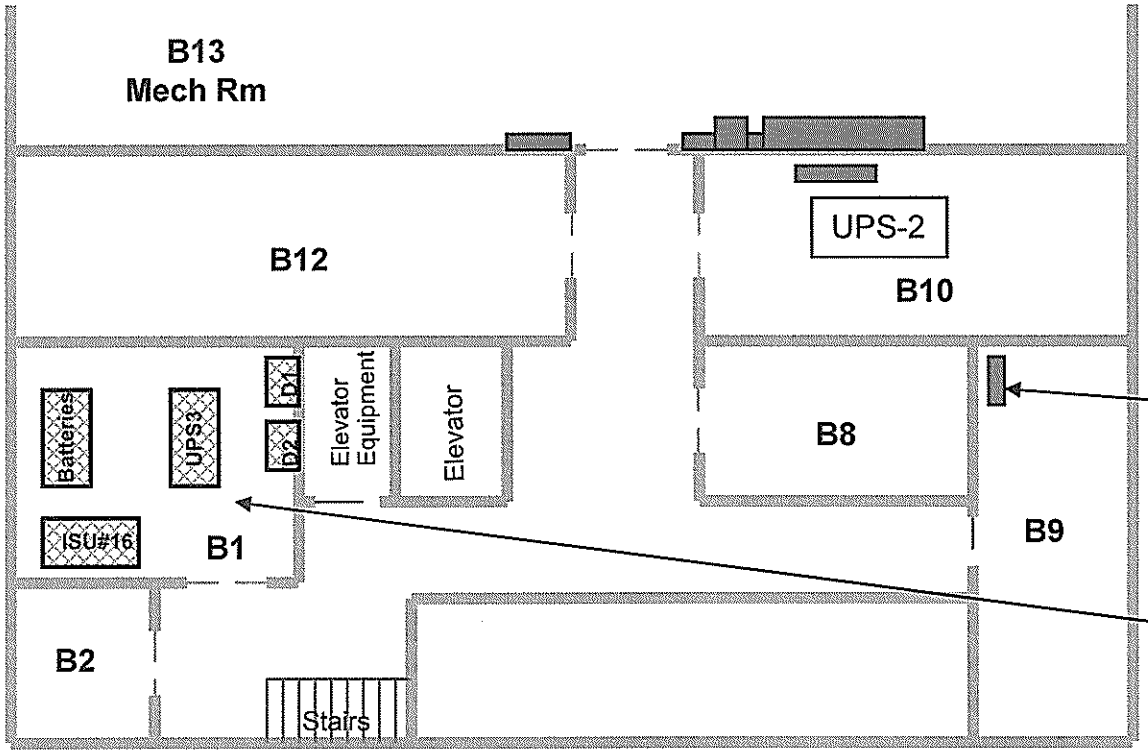
Additive #1



3/19/10 Baseline Plan

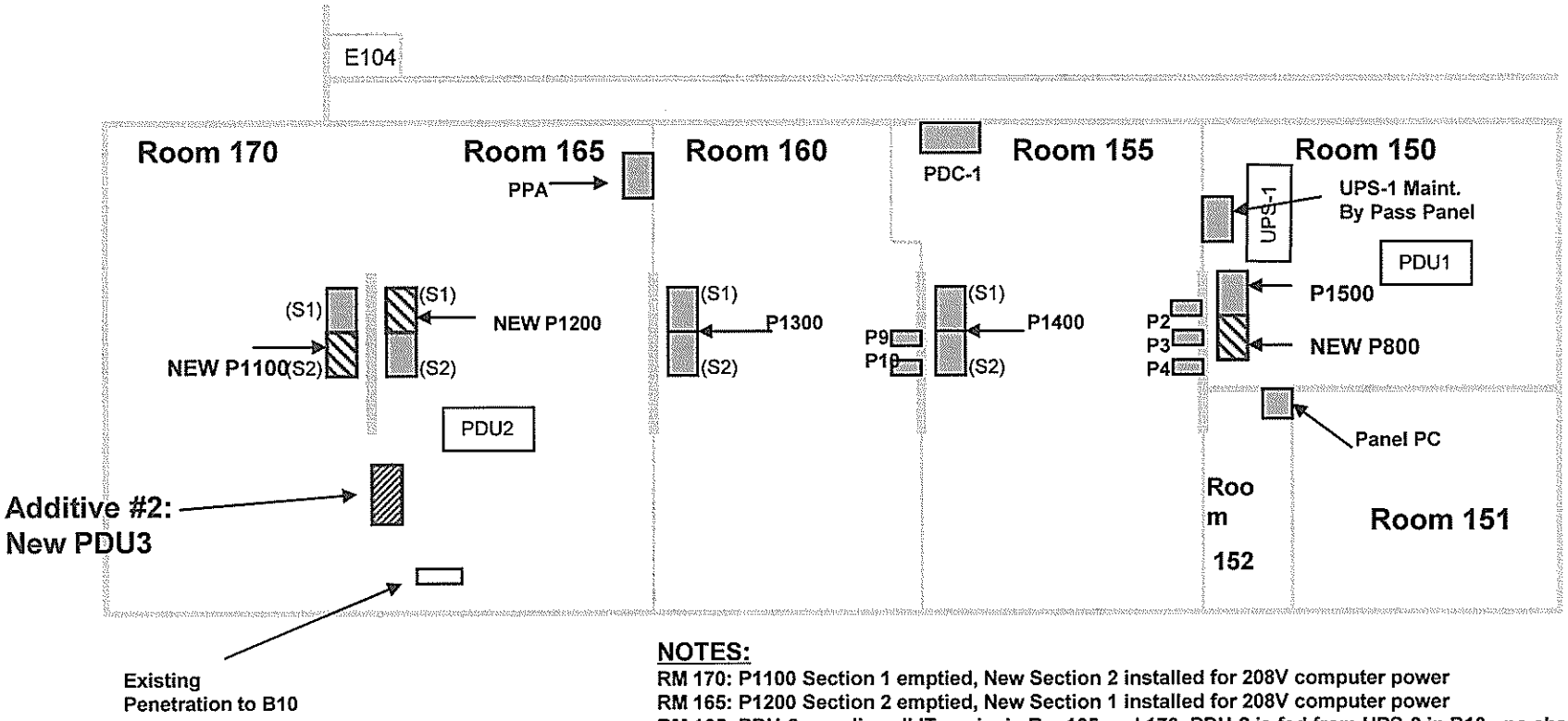
N233 New Equipment Layout

N233 Basement (partial)
Additive #2



N233 New Equipment Layout

N233 First Floor Computer Room Panels



Gray indicates RETAINED existing electrical panels

Indicates NEW 208V computer power electrical panel

New Emergency Power Off controls are not shown

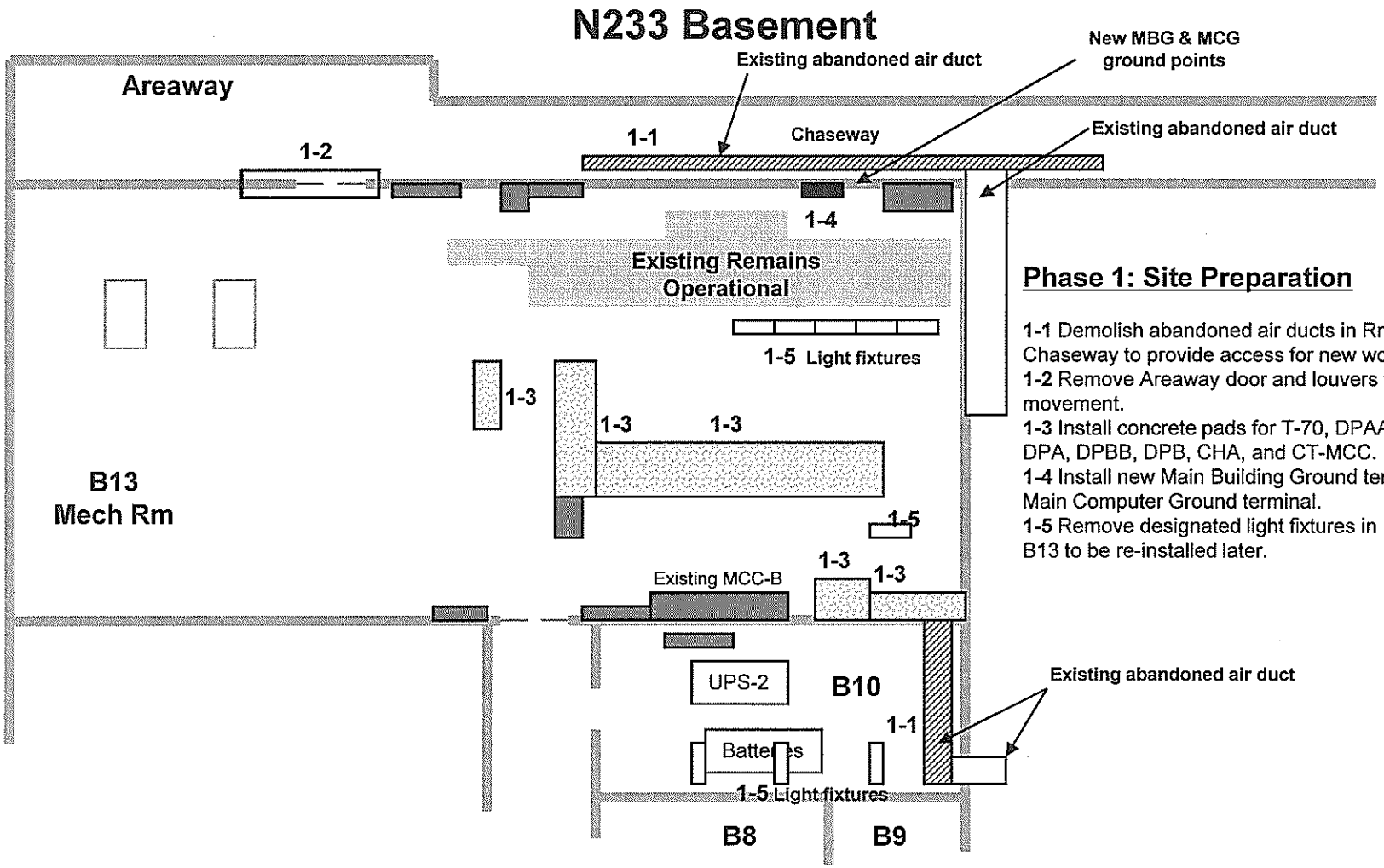
3/19/10 Baseline Plan

NOTES:

RM 170: P1100 Section 1 emptied, New Section 2 installed for 208V computer power
RM 165: P1200 Section 2 emptied, New Section 1 installed for 208V computer power
RM 165: PDU-2 supplies all IT equip. in Rm 165 and 170. PDU-2 is fed from UPS-2 in B10 - no change
RM 165: PPA provides 480V Bldg. Pwr to In-Space cooling Units (ISU's) in Rm 150, 165, and 170
RM 160: P1300 Section 1 contains new pull boxes for circuits P2900(208V) and P227A(480V)
RM 160: P1300 Section 2, emptied
RM 155: P1400 Section 1 empty
Rm 155: P1400 Section 2 contains new pull boxes for feeds to panels P9&10(208V), and to 2nd flr P245A(208V)
RM 155: PDC-1(208V) supplies panels P2, 3, & 4 - no change
RM 150: Maintenance Bypass Switch Panel has new direct 208V computer power feed from basement
RM 150: P1500 emptied
RM 150: New P800 installed for 208V computer power
RM 152: Panel PC is now fed from New P800(208V)

Phase 1: Site Preparation

Sheet 1 of 4



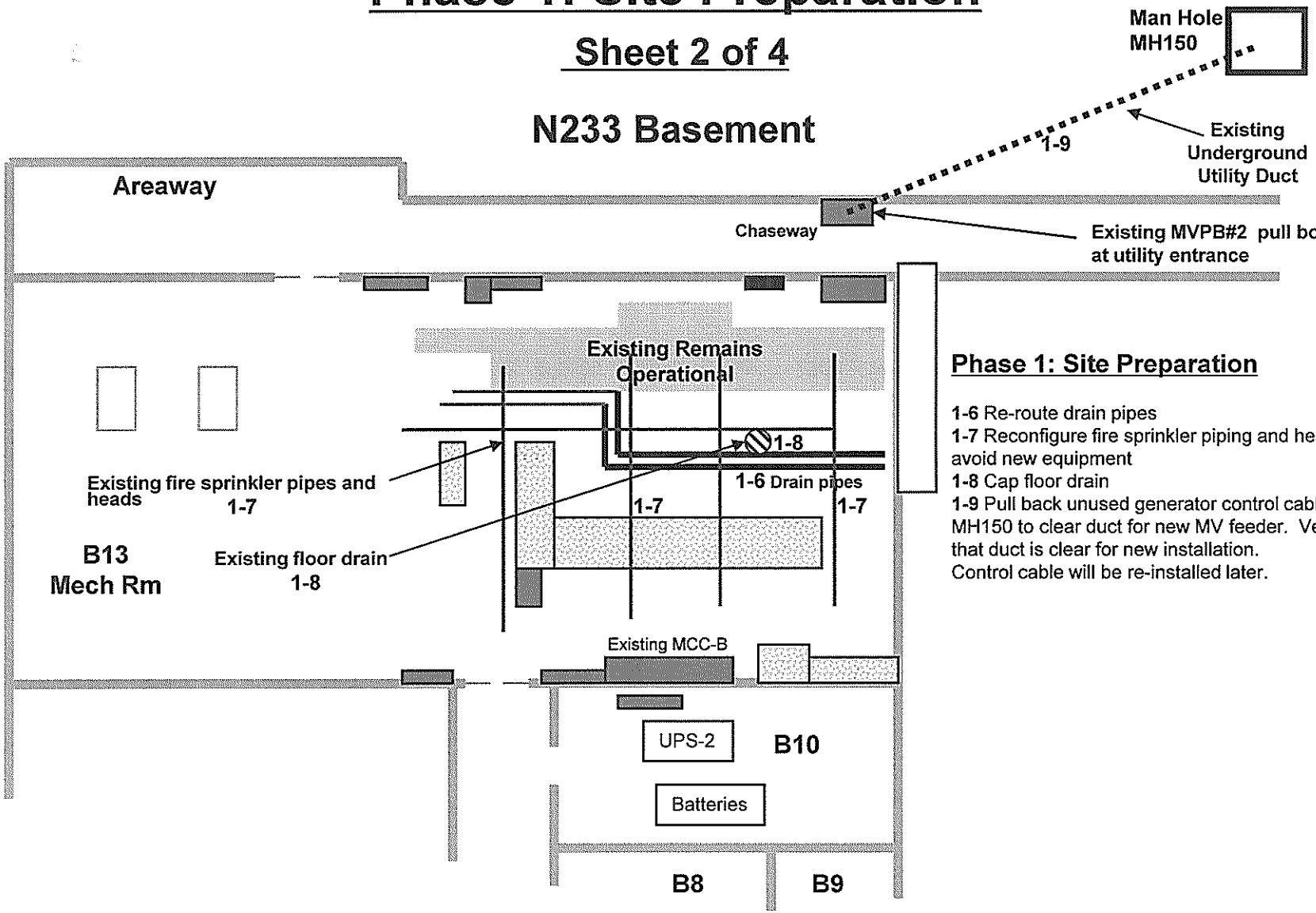
Phase 1: Site Preparation

1-1 Demolish abandoned air ducts in Rm B10 and Chaseway to provide access for new work.
1-2 Remove Areaway door and louvers for equip. movement.
1-3 Install concrete pads for T-70, DPAA, T70-1, DPA, DPBB, DPB, CHA, and CT-MCC.
1-4 Install new Main Building Ground terminal and Main Computer Ground terminal.
1-5 Remove designated light fixtures in B10 and B13 to be re-installed later.

Phase 1: Site Preparation

Sheet 2 of 4

N233 Basement



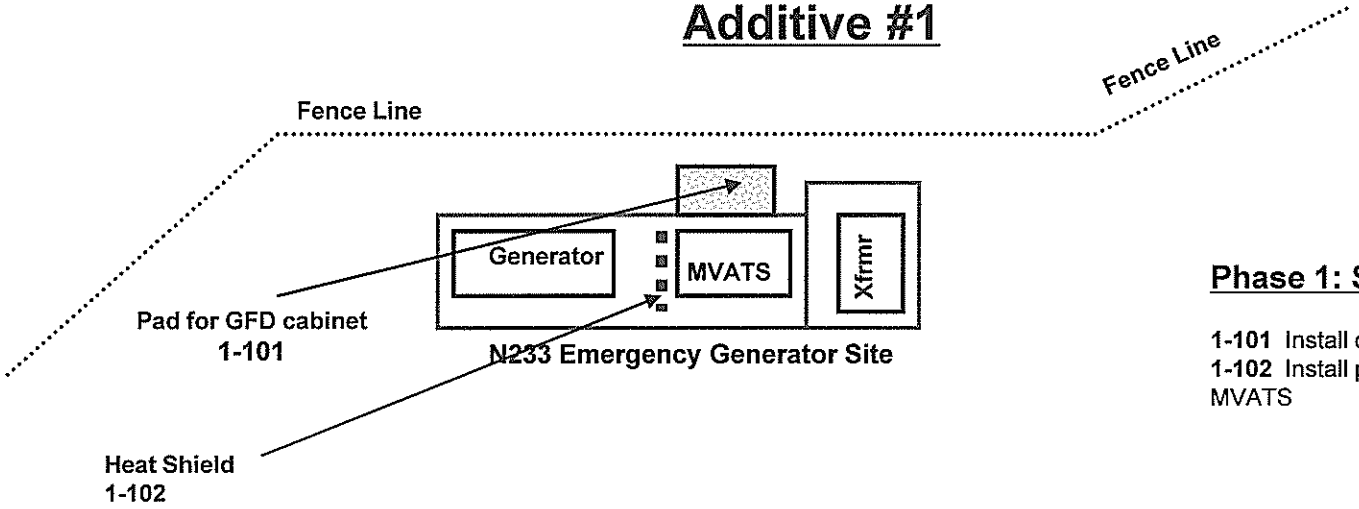
Phase 1: Site Preparation

1-6 Re-route drain pipes
1-7 Reconfigure fire sprinkler piping and heads to avoid new equipment
1-8 Cap floor drain
1-9 Pull back unused generator control cable to MH150 to clear duct for new MV feeder. Verify that duct is clear for new installation.
Control cable will be re-installed later.

Phase 1: Site Preparation

Sheet 3 of 4

Additive #1



Phase 1: Site Preparation

1-101 Install concrete pad for GFD cabinet
1-102 Install pre-fabricated heat shield at MVATS

Parking Lot

N233 Building

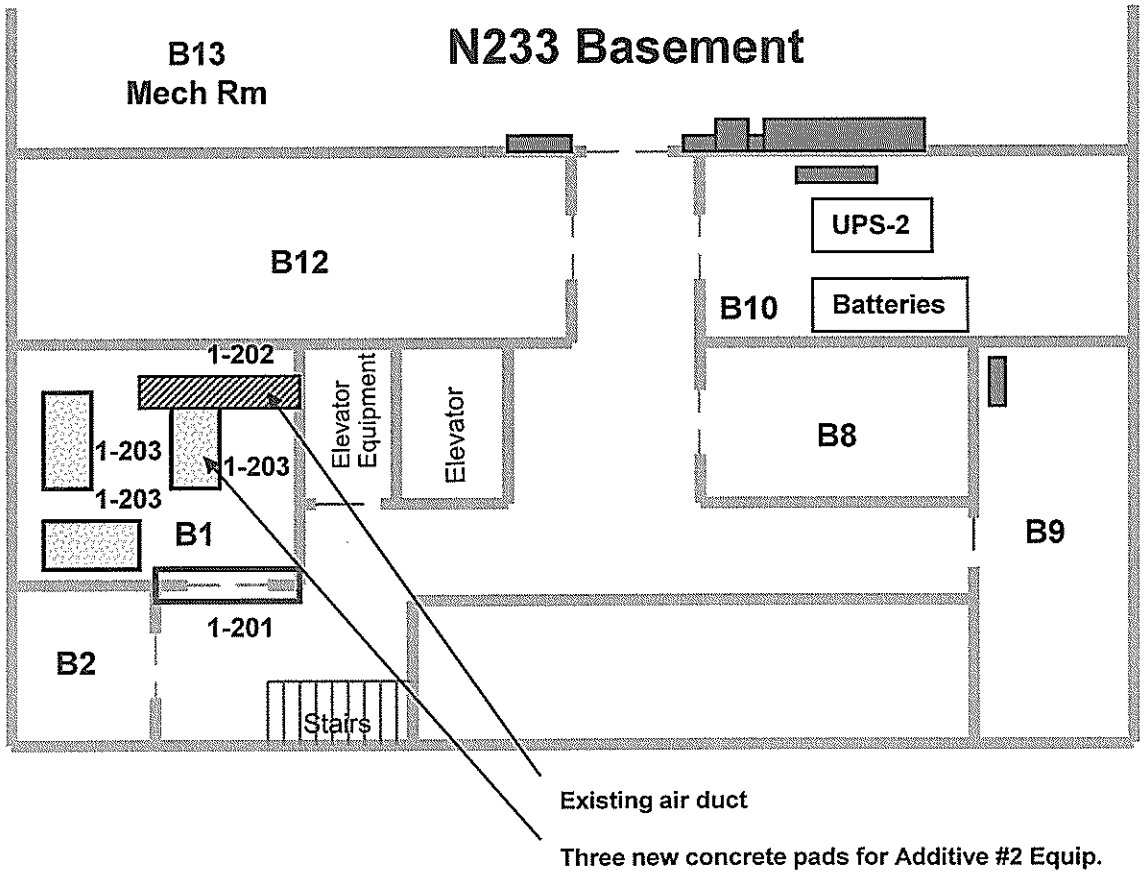
Area Way

3/19/10 Baseline Plan

Phase 1: Site Preparation

Sheet 4 of 4

Additive #2



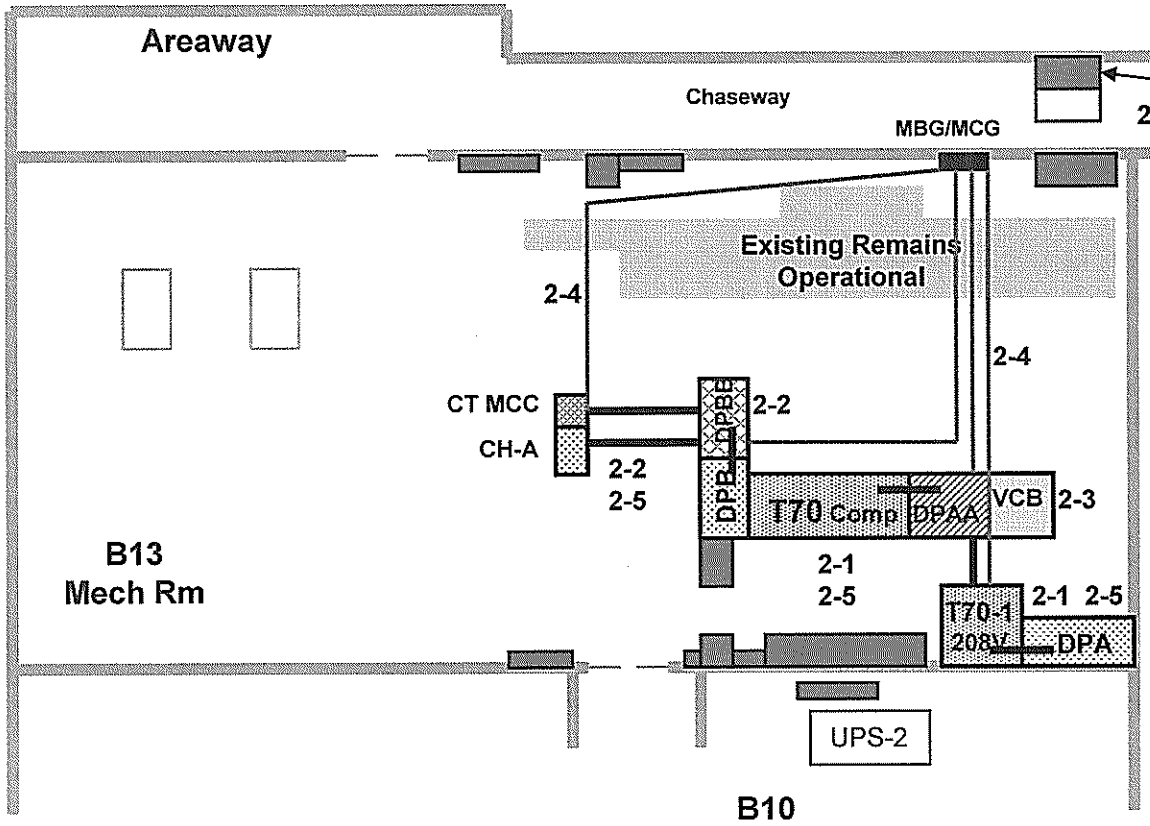
Phase 1: Site Preparation

1-201 Modify entrance door and relocate light switch.
1-202 Remove existing air duct.
1-203 Install concrete pads for UPS3, Battery Cabinet, and ISU#16

Phase 2: Equipment Placement

Sheet 1 of 2

N233 Basement



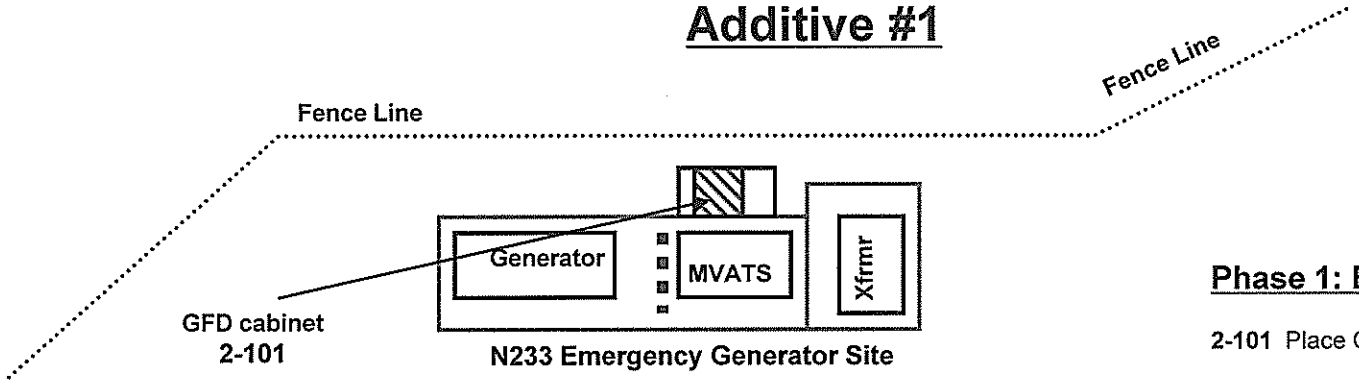
Phase 2: Place New Equipment

2-1 Place T70, DPAA, T70-1, and DPA. Connect T70 output to DPAA. Install DPAA circuit to T70-1, and connect T70-1 output to DPA.
2-2 Place DPBB, DPB, CHA, and CT-MCC. Install DPBB circuits to DPB, CHA, and CT-MCC.
2-3 Place Temporary VCB next to DPAA.
2-4 Install equipment grounds to MGB and MCG terminals.
2-5 HiPot test all new equipment, panel boards, and cables
2-6 Enlarge existing MVPB#2 to accommodate new MV feeder and deadbreak connectors

Phase 2: Equipment Placement

Sheet 2 of 3

Additive #1



Phase 1: Equipment Placement

2-101 Place GFD Cabinet on new pad

Parking Lot

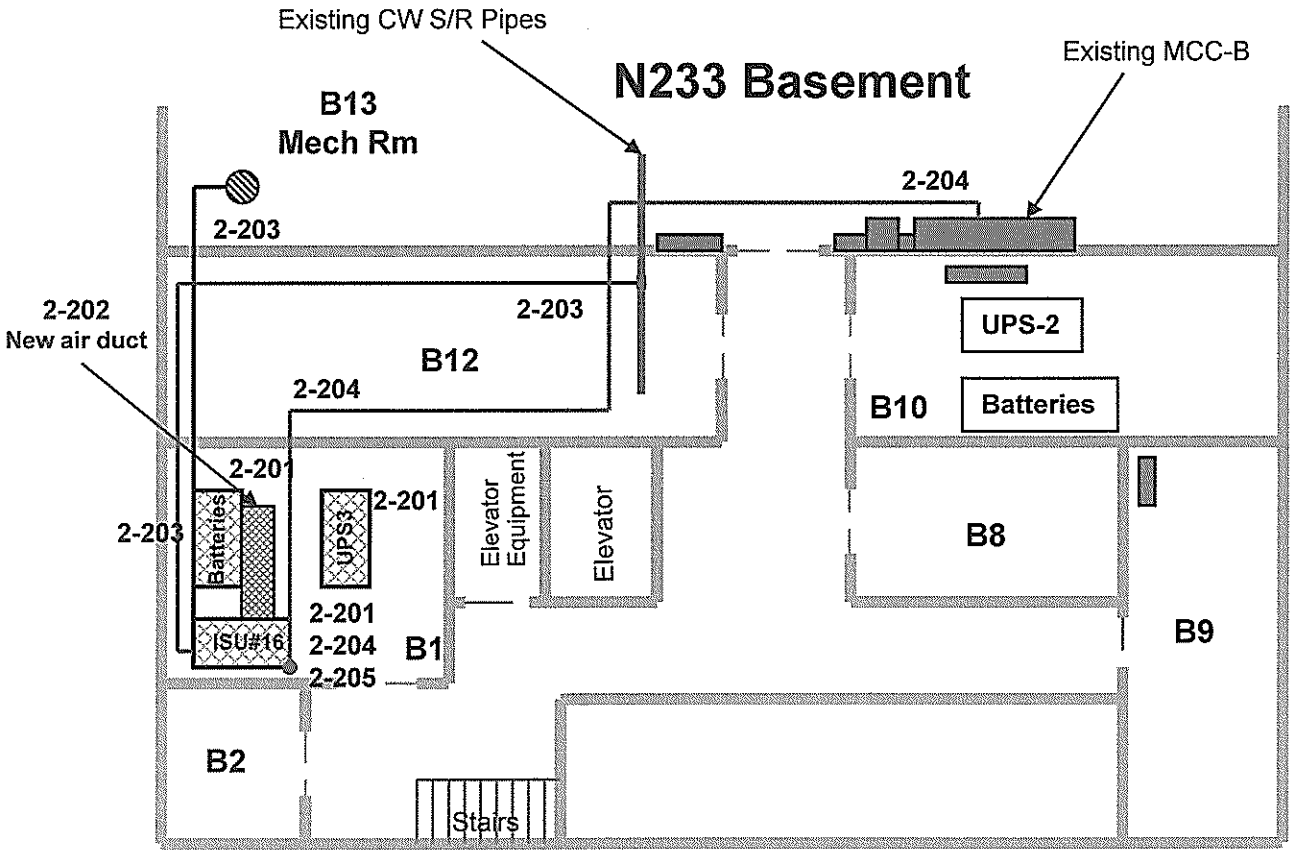
N233 Building

Area Way

3/19/10 Baseline Plan

Phase 2: Equipment Placement

Sheet 3 of 3
Additive #2



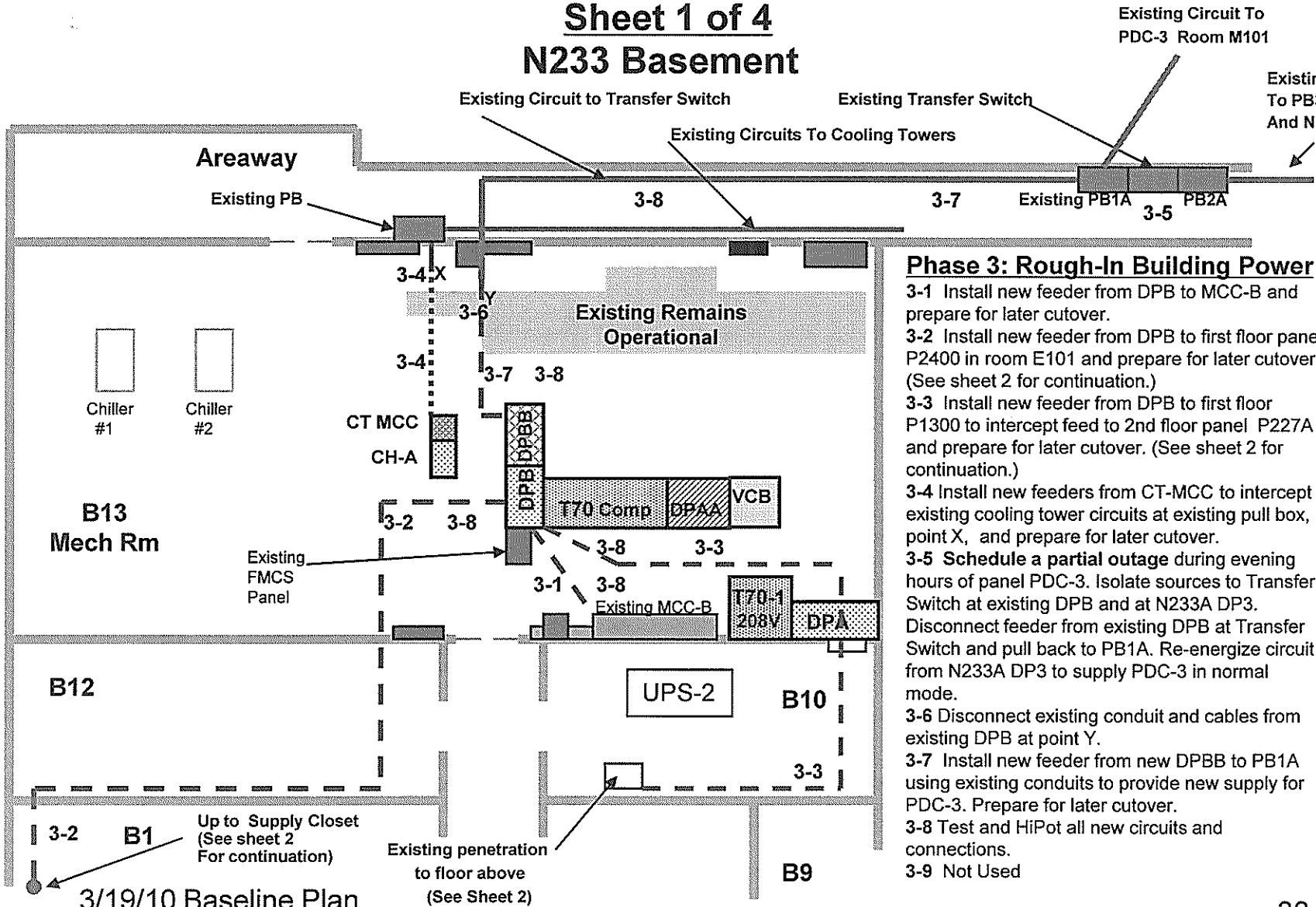
Phase 2: Equipment Placement

2-201 Place UPS3, Battery Cabinet, and ISU#16 on pads in room B1
2-202 Install new air duct for ISU#16
2-203 Install chilled water supply and return to ISU#16, intercepting existing piping in room B12. Install ISU condensate drain with discharge into floor drain in room B13.
2-204 Install electrical supply for ISU#16 with source at existing MCC-B.
2-205 Test ISU#16 operation.

Phase 3: Rough-In Bldg. Power

Sheet 1 of 4

N233 Basement



Phase 3: Rough-In Building Power

3-1 Install new feeder from DPB to MCC-B and prepare for later cutover.

3-2 Install new feeder from DPB to first floor panel P2400 in room E101 and prepare for later cutover. (See sheet 2 for continuation.)

3-3 Install new feeder from DPB to first floor P1300 to intercept feed to 2nd floor panel P227A and prepare for later cutover. (See sheet 2 for continuation.)

3-4 Install new feeders from CT-MCC to intercept existing cooling tower circuits at existing pull box, point X, and prepare for later cutover.

3-5 Schedule a partial outage during evening hours of panel PDC-3. Isolate sources to Transfer Switch at existing DPB and at N233A DP3. Disconnect feeder from existing DPB at Transfer Switch and pull back to PB1A. Re-energize circuit from N233A DP3 to supply PDC-3 in normal mode.

3-6 Disconnect existing conduit and cables from existing DPB at point Y.

3-7 Install new feeder from new DPBB to PB1A using existing conduits to provide new supply for PDC-3. Prepare for later cutover.

3-8 Test and HiPot all new circuits and connections.

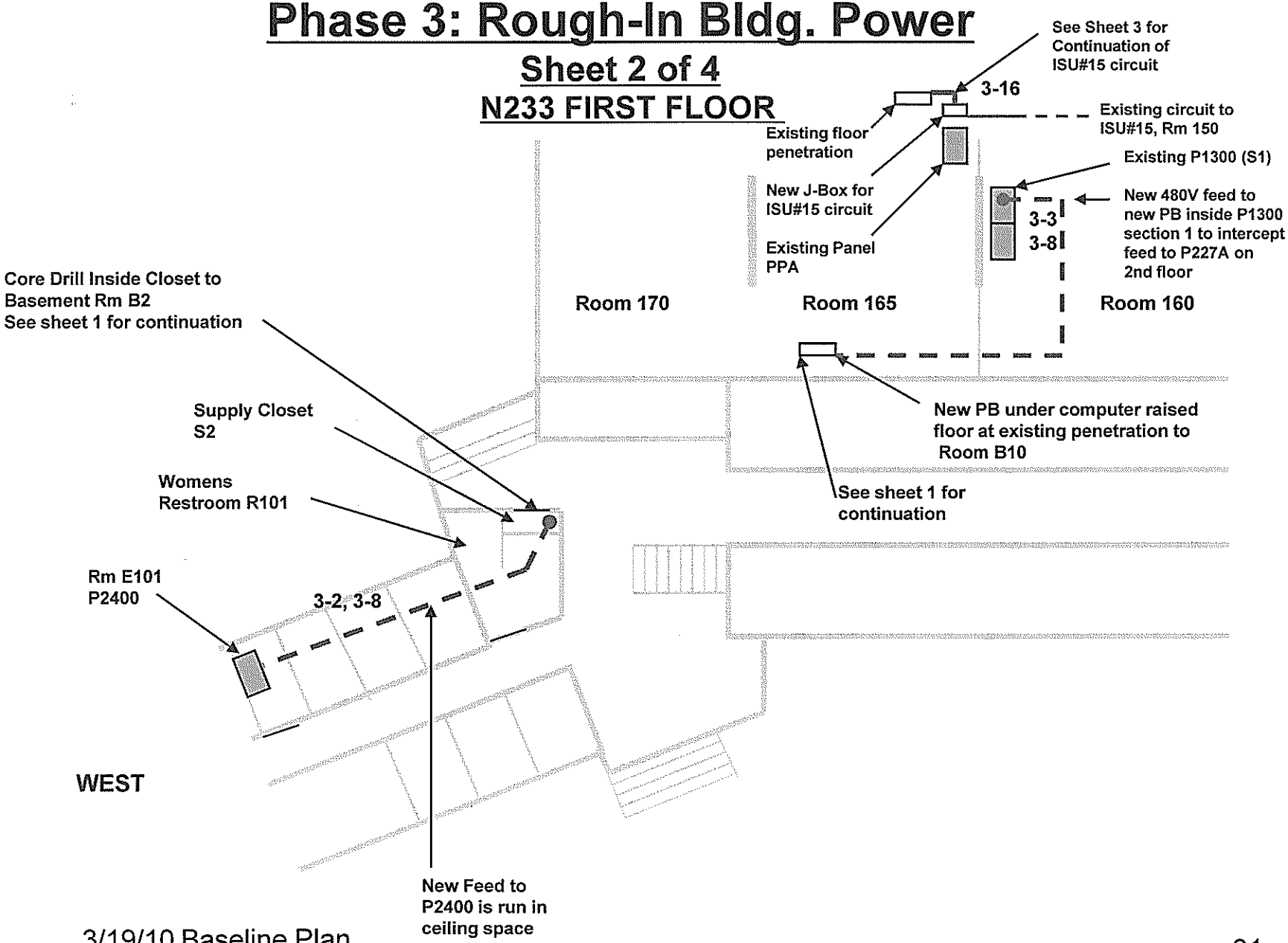
3-9 Not Used

Building Outage: 0 Partial: 1

Phase 3: Rough-In Bldg. Power

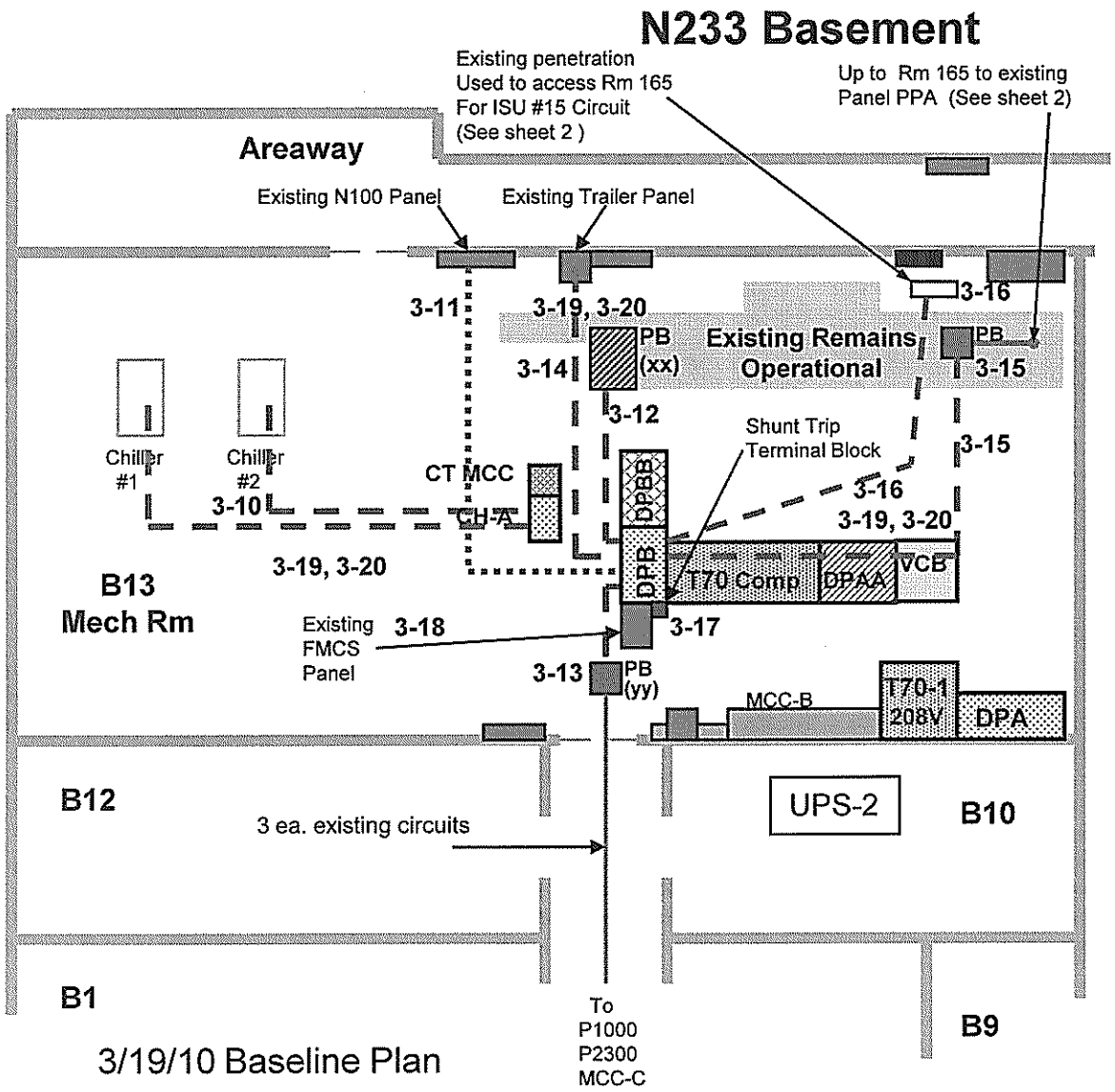
Sheet 2 of 4

N233 FIRST FLOOR



Phase 3: Rough-In Bldg. Power

Sheet 3 of 4



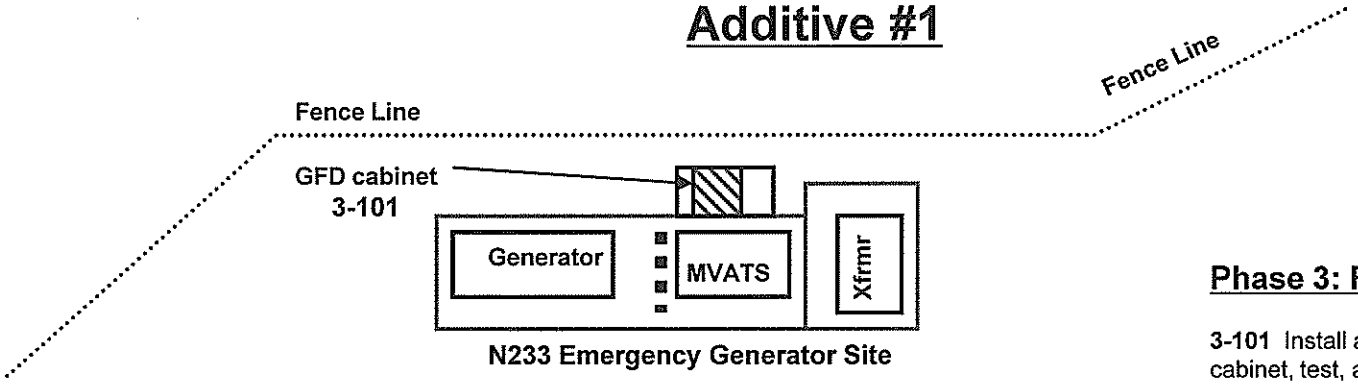
Phase 3: Rough-In Building Power

3-10 Install new feeders from CHA to chillers and prepare for later cutover.
3-11 Install new feeder from DPB to panel N100 and prepare for later cutover.
3-12 Install new feeders to new Pull Box (xx) to intercept existing circuits(Panel J, Contactor Cntrl, Panel 1000, & Panel 2500). Prepare for later cutover.
3-13 Install new feeders and Pull Box (yy) to intercept 3 existing circuits (P1000, P2300, and MCC-C). Prepare for later cutover.
3-14 Install new feeders to Trailer Panel, P4000, and others. Prepare for later cutover.
3-15 Install new feeder to Panel PPA in Rm 165. Intercept existing with new PB. Prepare for later cutover.
3-16 Install new ISU#15 circuit from DPB via existing penetration to new J-Box in Rm 165 to intercept existing circuit. See sheet 2 for continuation. ISU#15 is presently powered from PPA. Prepare for later cutover.
3-17 Install circuits to connect designated DPBB, and DPB breaker shunt trips to terminal block and test operation of each shunt-trip
3-18 Install conduits for FMCS monitoring circuits as required. Others will install wiring.
3-19 Install all electrical and equipment grounds
3-20 HiPot test all new circuits and connections.

Phase 3: Rough-In Bldg Power

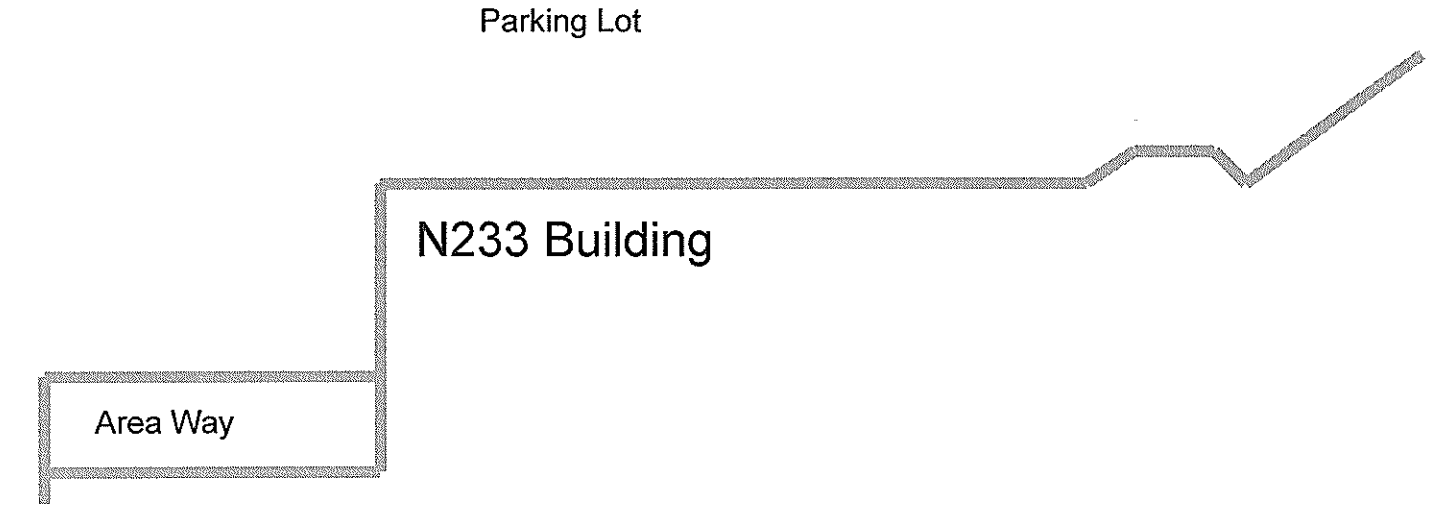
Sheet 4 of 4

Additive #1



Phase 3: Rough-In Bldg. Power

3-101 Install and wire GFD components in cabinet, test, and ready for MV connection

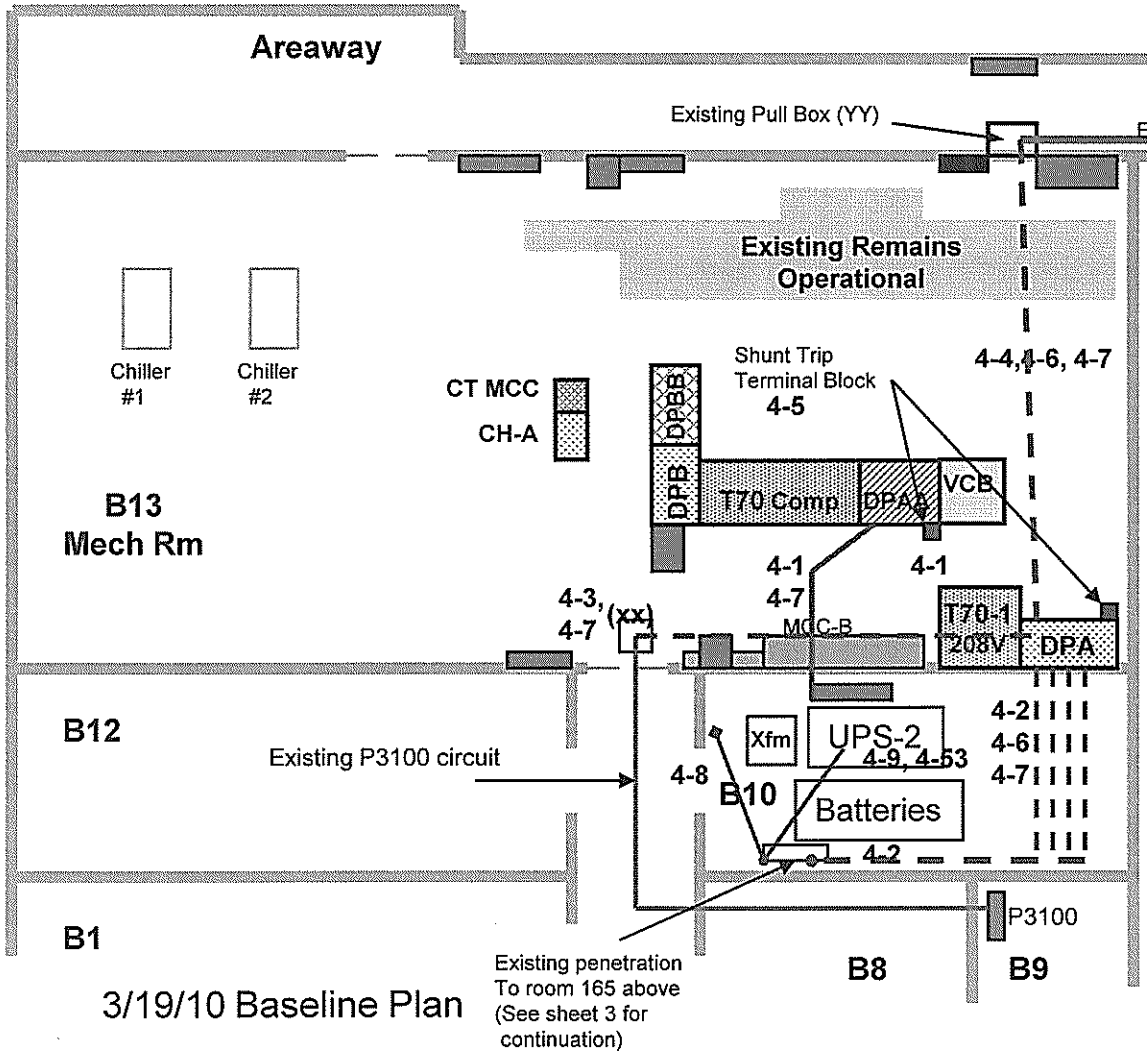


3/19/10 Baseline Plan

Phase 4: Rough-In Computer Power

Sheet 1 of 7

N233 Basement



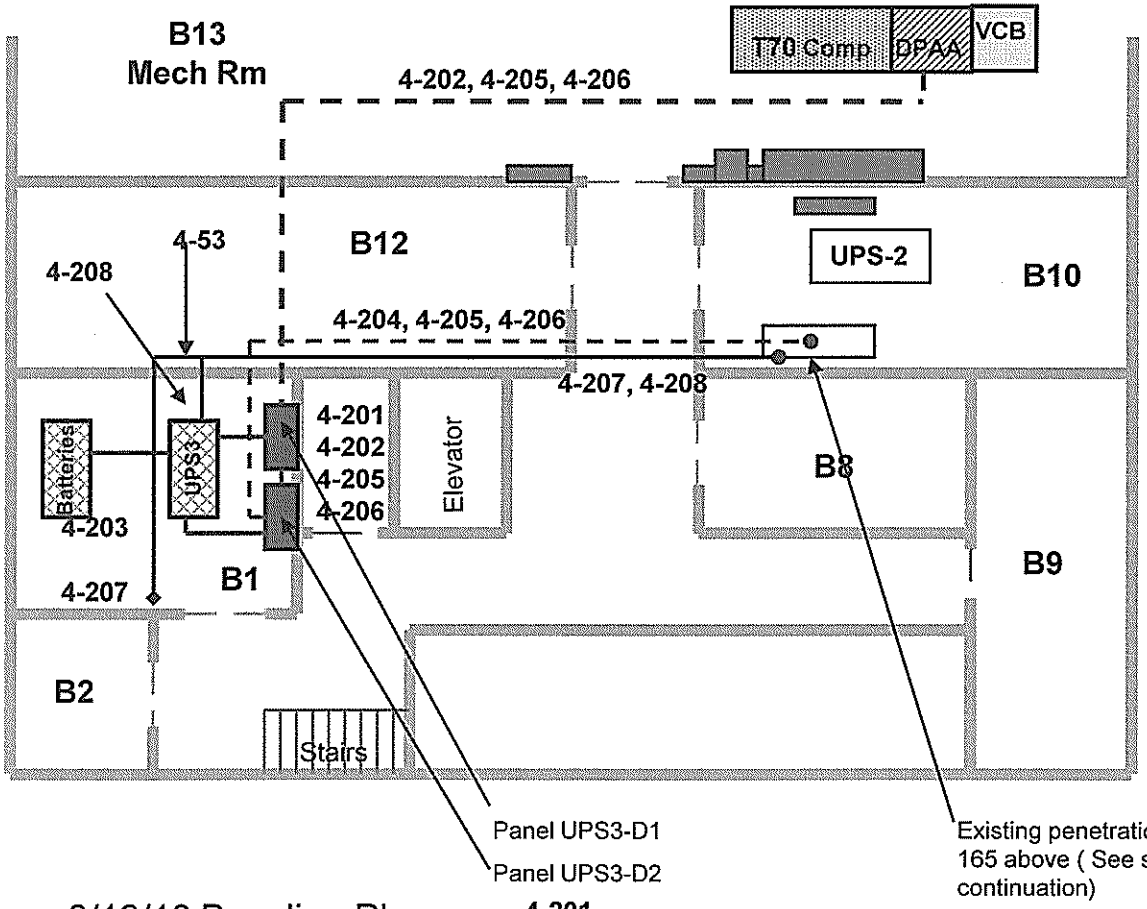
Phase 4: Rough-In Computer Power

4-1 Install new feeder from DPAA to UPS#2 Maint Bypass Panel and prepare for later cutover.
4-2 Install new feeders from DPA to computer rooms 150, 155, 160, 165,170 and prepare for later cutover. See sheets 3 & 4 for continuation.
4-3 Install feeder from DPA to new pull box (xx) to intercept existing feed to P3100 and prepare for later cutover.
4-4 Install feeder from DPA to existing pull box (YY) to intercept feeder to PDC-1 and prepare for later cutover.
4-5 Install circuits to connect DPAA, and DPA circuit breaker shunt trips to terminal blocks and test operation of each shunt-trip
4-6 Install computer ground connections
4-7 HiPot test all new circuits and connections
4-8 Install EPO button at room B10 exit and connect to first floor EPO controls.
4-9 Install EPO control circuit to UPS#2 and prepare for cutover at a later time.
4-53 See sheet 7.

Phase 4: Rough-In Computer Power

Sheet 2 of 7
Additive #2

N233 Basement



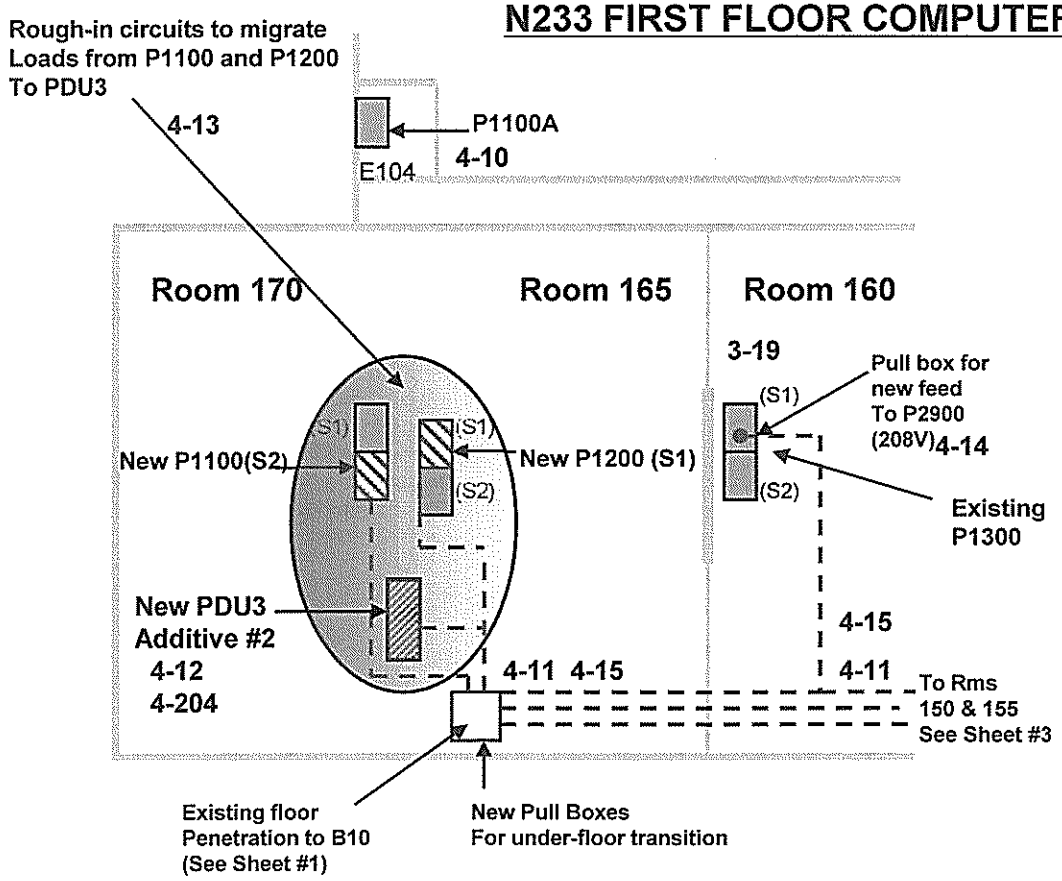
Phase 4: Rough-In Computer Power

4-201 Install UPS input and output panels, UPS3-D1 and UPS3-D2 and associated bypass circuits.
4-202 Install UPS3 power feeder circuit from DPAA to panel UPS3-D1.
4-203 Install circuit to connect UPS3 with batteries.
4-204 Install PDU-3 in room 165. Install circuit from UPS3-D2 to supply PDU-3. See sheet 3 for continuation.
4-205 Install all electrical grounds
4-206 HiPot test all new circuits and connections.
4-207 Install EPO button at Room B1 exit and connect to first floor EPO controls.
4-208 Install EPO control circuit to UPS3 and prepare for connection at a later time.
4-53 See sheet 7.

Phase 4: Rough-In Computer Power

Sheet 3 of 7

N233 FIRST FLOOR COMPUTER ROOMS (PARTIAL)



Note: All work in computer rooms must be coordinated with the Gov. - See Page 4.

Phase 4: Rough-In Computer Power

(See sheet 1 for steps 4-1 thru 4-9)
4-10 Remove un-used panel P1100A from room E104
4-11 Continuing from steps 4-2 and 4-202 place new feeders under computer raised floor in rooms 160, 165, and 170.
4-12 Additive #2: Install PDU3
4-13 Install circuits required to migrate all loads from panels P1100 and P1200 to the PDU and prepare for later cutover. Approximately 60 circuits total
4-14 Install new pull box at P1300 and feeder from DPA to intercept existing circuit to P2900
4-15 Ensure that all new feeders are HiPot tested at time of installation.
4-16 Not Used
4-17 Not Used
4-18 Not Used
4-19 Not Used
4-204 See sheet 2.

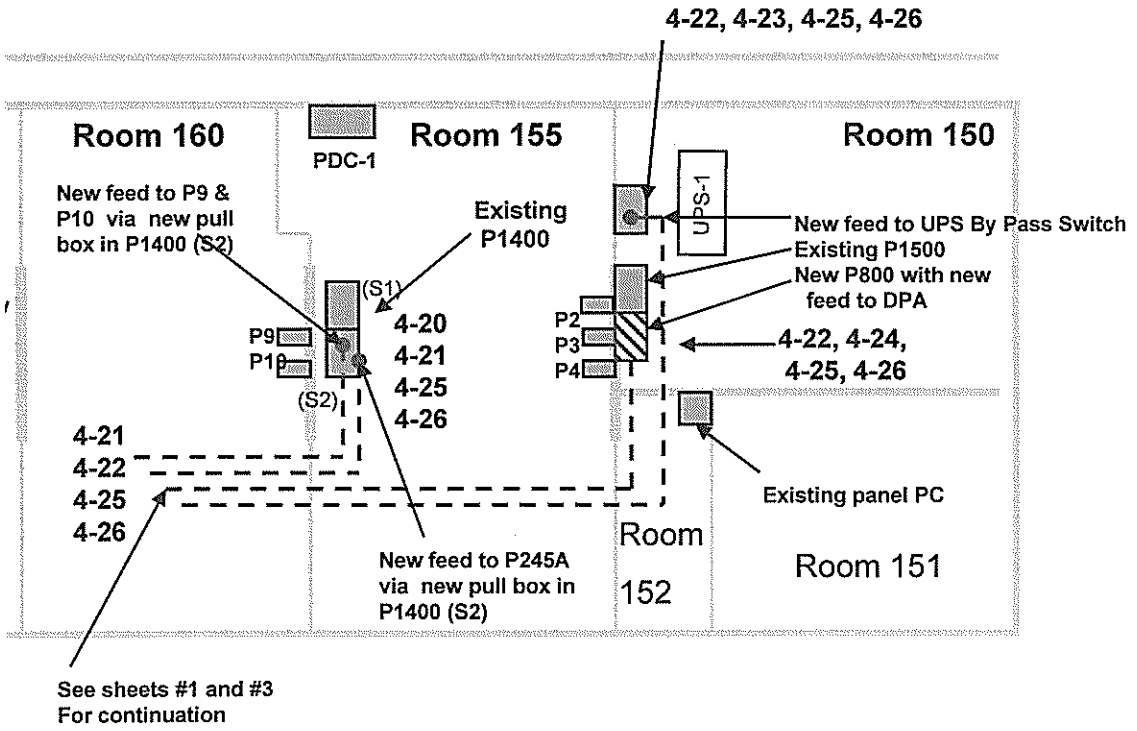
Phase 4: Rough-In Computer Power

Sheet 4 of 7

N233 FIRST FLOOR COMPUTER ROOMS (PARTIAL)

Phase 4: Rough-In Computer Power

(See sheets 1 & 3 for steps 4-1 thru 4-15)
4-20 Existing panel P1400, Sections 1 & 2 are empty and used as paths for two existing circuits
4-21 Complete the installation (ref. Step 4-2) of the new feeders under computer raised floor from new DPA to P1400 and install two pull boxes inside P1400 Section 2 to intercept existing circuits to P245A and to P9&P10. Prepare for cutover at a later time.
4-22 Complete the installation (ref. step 4-2) of the two new feeders under the computer raised floor from the new DPA to room 150. Prepare for cutover at a later time.
4-23 Prepare the new feeder for UPS#1 for cutover at the Maintenance By Pass panel. Cutover will occur at a later time.
4-24 Prepare the new feeder for the new P800 panel which will be installed at a later time.
4-25 Install new computer grounds.
4-26 Test all new feeders with HiPot tests
4-27 Not Used
4-28 Not Used
4-29 Not Used

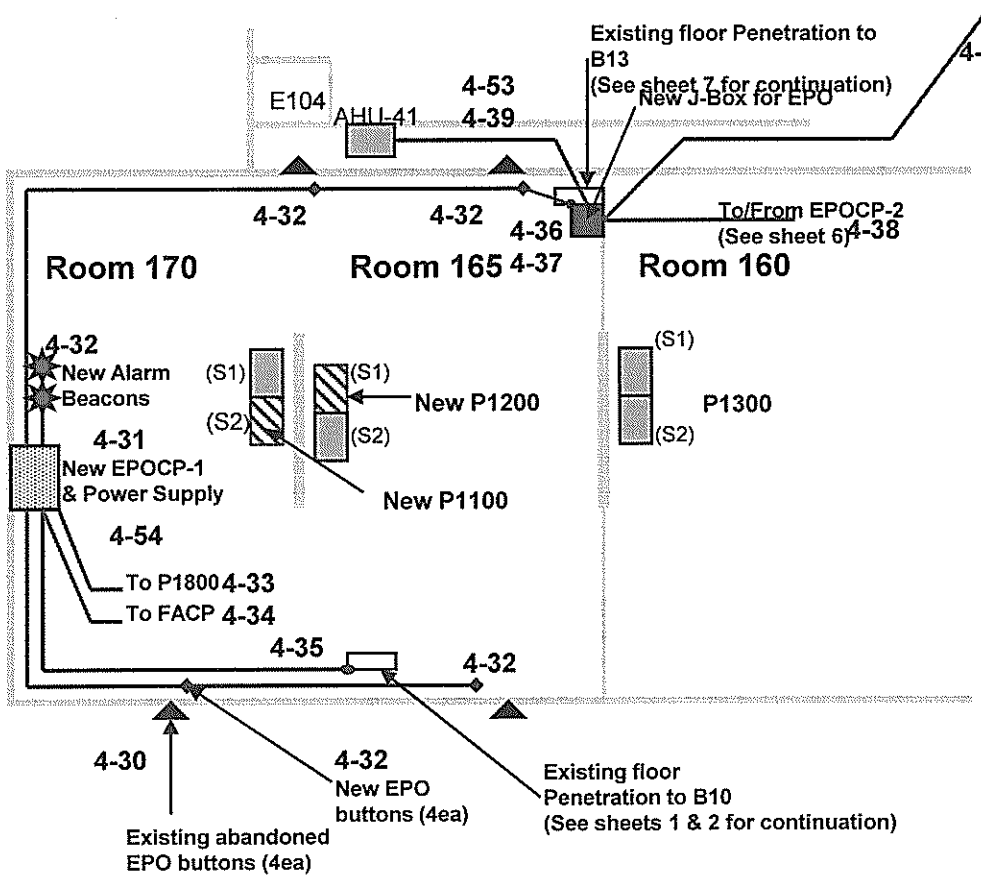


Note: All work in computer rooms must be coordinated with the Gov. - See Page 4.

Phase 4: Rough-In Computer Power

Sheet 5 of 7

N233 FIRST FLOOR COMPUTER ROOMS (PARTIAL)
EPO Zone 1 Installation



Note: All work in computer rooms must be coordinated with the Gov. - See Page 4.

Phase 4: Rough-In Computer Power

4-30 Remove old EPO buttons and safe old wiring in computer rooms 165 and 170.
4-31 Install new EPOCP-1 and power supply on west wall of room 170.
4-32 Install new EPO buttons in rooms 165 an 170 and new alarm beacons in room 170.
4-33 Install 120V power circuit from panel P1800 in elect. closet room 123 to new EPOCP-1.
4-34 Install control circuits from N233 Fire Alarm Control Panel (FACP) to new EPOCP-1
4-35 Install UPS control circuits (for later cutover) and EPO button circuits to rooms B1 and B10 (refer to sheets #1 and #2).
4-36 Install shunt-trip circuits to new breakers via existing penetration to room B13 (Refer to sheet 7).
4-37 Install shunt-trip circuits to MCC-B for control of AH-31 and ISU #16, and prepare for cutover at a later time. Refer to sheet 7.)
4-38 Install beacon circuits for room 151 and N233A room 195.
4-39 Install EPO control circuits for AHU-41 and prepare for cutover at a later time.
4-53 See sheet 7.
4-54 See sheet 7.

Phase 4: Rough-In Computer Power

Sheet 6 of 7

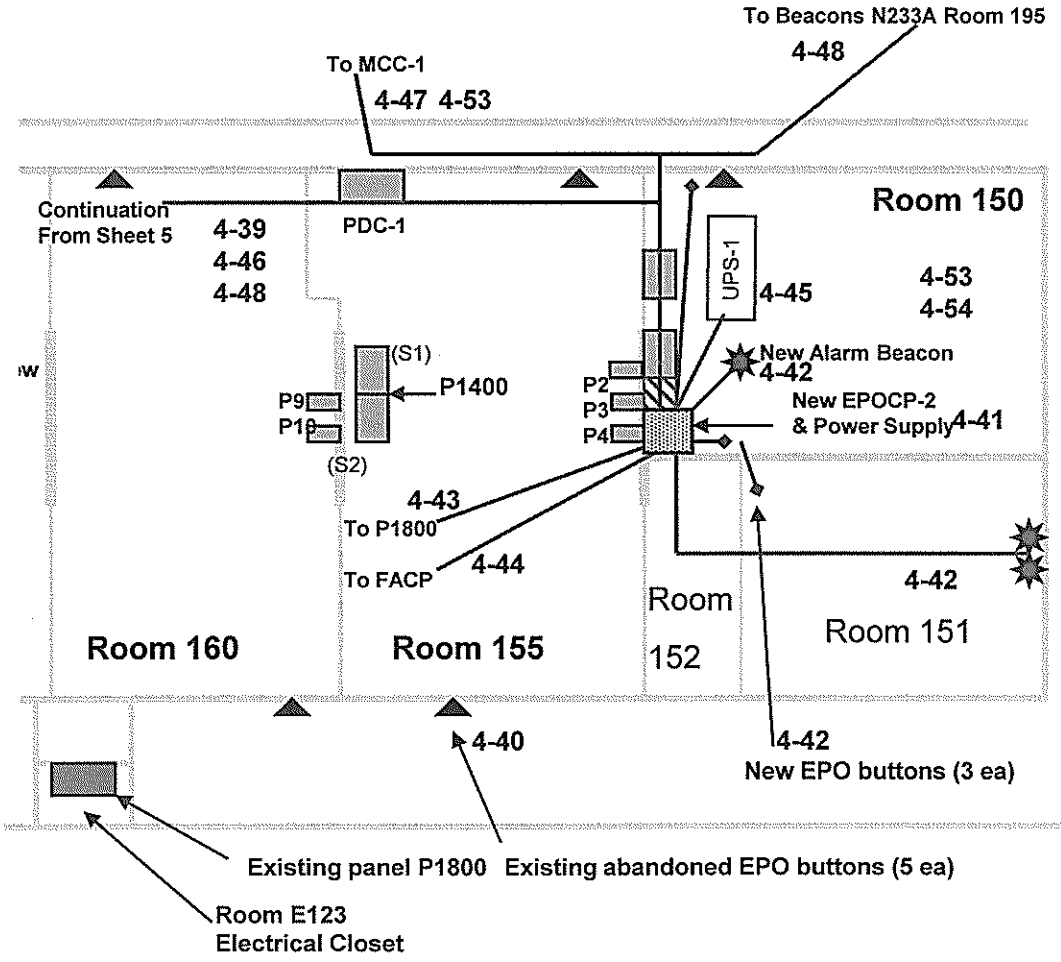
N233 FIRST FLOOR COMPUTER ROOMS (PARTIAL)
EPO Zone 2 Installation

Phase 4: Rough-In Computer Power

4-39 Install EPO control circuits for AHU-41 and prepare for cutover at a later time. (Refer to sheet 5)
4-40 Remove old EPO buttons and safe old wiring in computer rooms 150, 155, and 160.
4-41 Install new EPOCP-2 and power supply on west wall of room 150.
4-42 Install new EPO buttons in rooms 150 an 151 and alarm beacons in room 150 and 151.
4-43 Install 120V power circuit from panel P1800 in elect. closet room 123 to new EPOCP-2.
4-44 Install control circuits from N233 Fire Alarm Control Panel (FAPC) to new EPOCP-2
4-45 Install UPS-1 control circuit for cutover at a later time.
4-46 Install shunt-trip circuits to new breakers via existing penetration to room B13 (Refer to sheet 7).
4-47 Install shunt-trip circuits to MCC-1 for control of FCU#1 and FCU#3, and prepare for cutover at a later time.
4-48 Install beacon circuits for room 170 and N233A room 195.
4-49 Not Used

4-53 See sheet 7.
4-54 See sheet 7.

Note: All work in computer rooms must be coordinated with the Gov. - See Page 4.

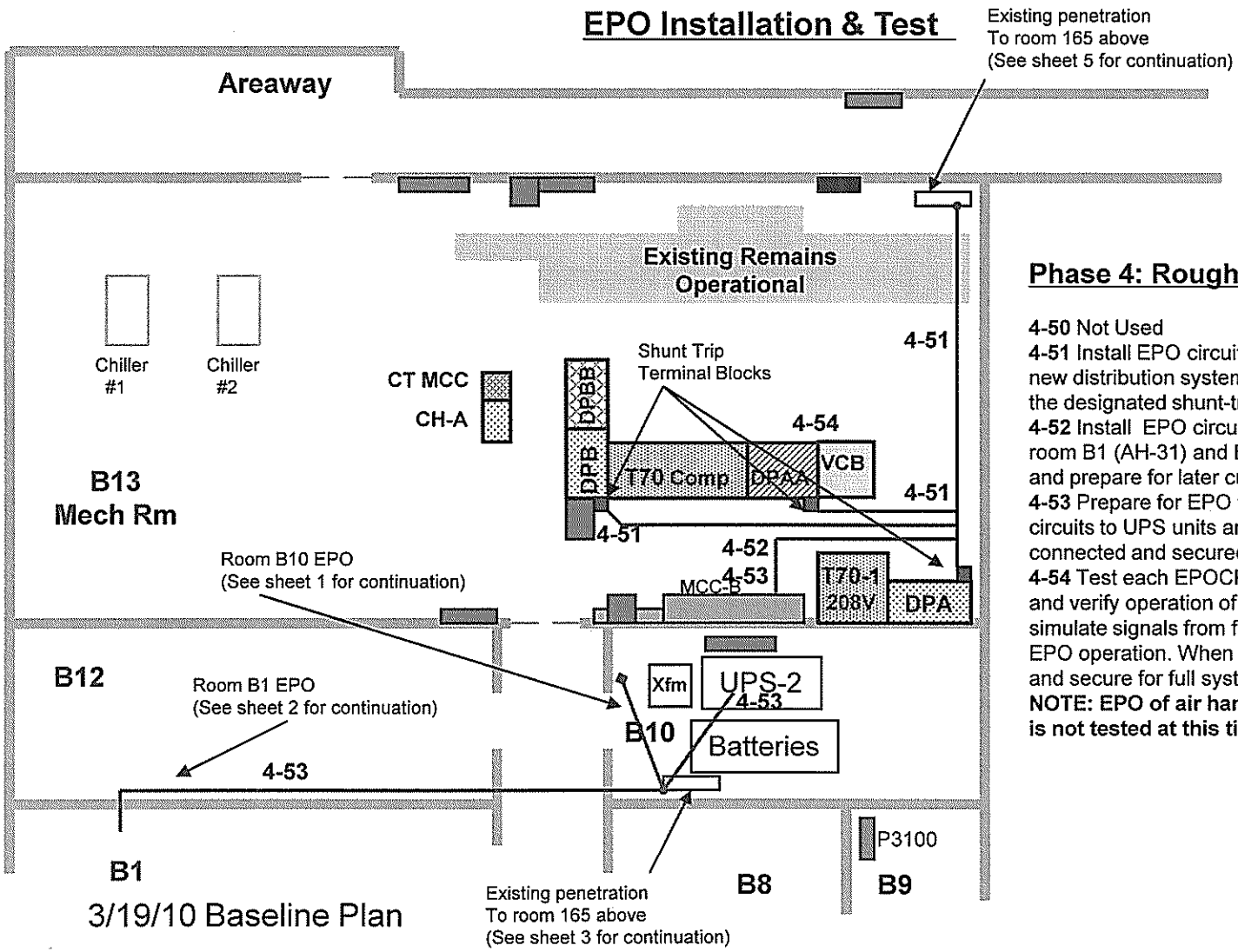


Phase 4: Rough-In Computer Power

Sheet 7 of 7

N233 Basement

EPO Installation & Test



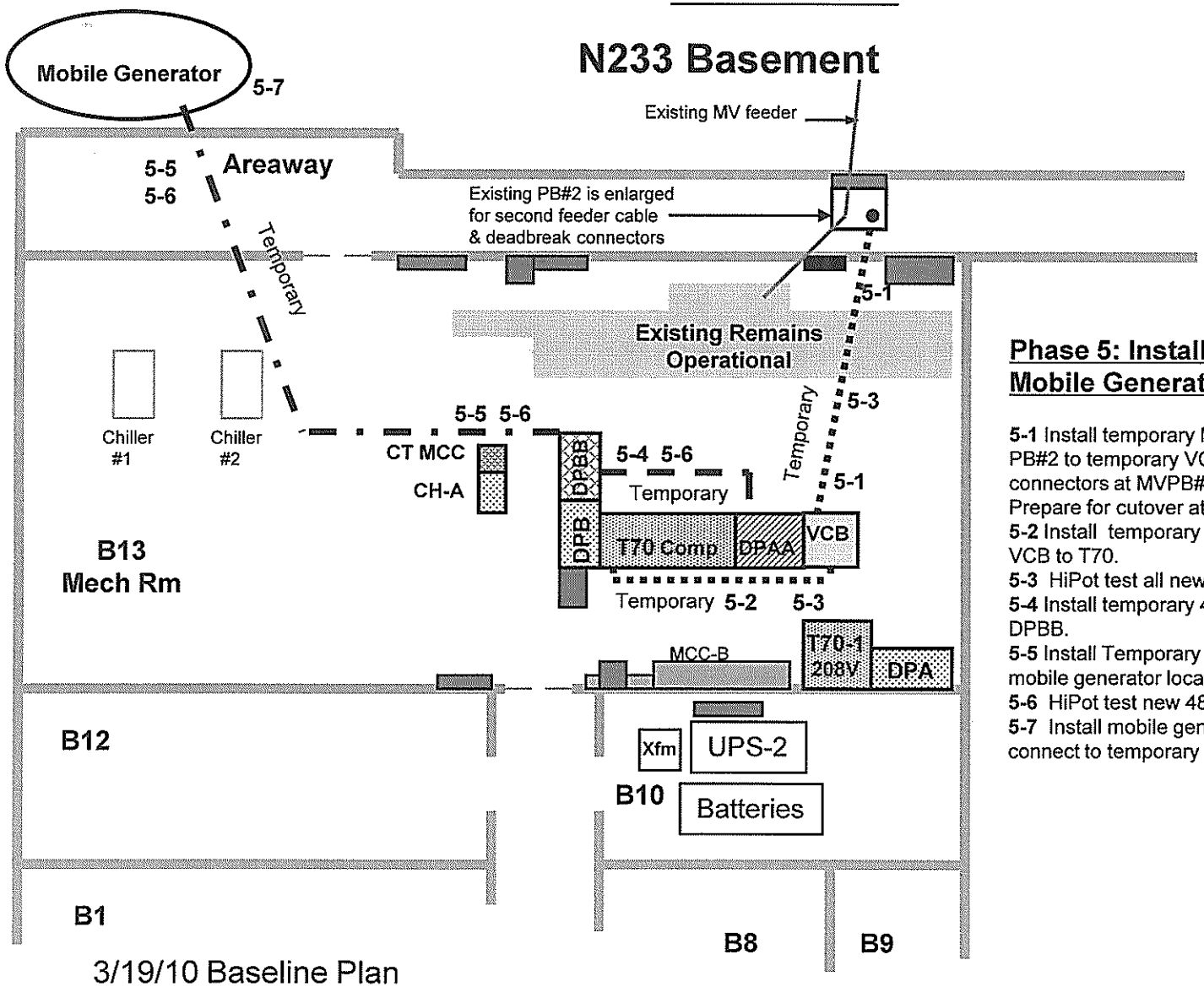
3/19/10 Baseline Plan

Phase 4: Rough-In Computer Power

4-50 Not Used
4-51 Install EPO circuits to connect EPOCP's to the new distribution system DPAA, DPA, DPBB, DPB at the designated shunt-trip terminal blocks.
4-52 Install EPO circuits to MCC-B for control of room B1 (AH-31) and B10 (ISU#16) air handlers and prepare for later cutover.
4-53 Prepare for EPO tests. Ensure that new EPO circuits to UPS units and air handlers are not connected and secured safe.
4-54 Test each EPOCP for correct logical operation and verify operation of shunt-trip circuits. Also simulate signals from fire alarm system and verify EPO operation. When completed turn off EPOCP's and secure for full system test in later phase.
NOTE: EPO of air handlers and UPS equipment is not tested at this time.

Phase 5: Install Temp. Power Circuits & Mobile Generator

Sheet 1 of 1



Phase 5: Install Temp. Power & Mobile Generator

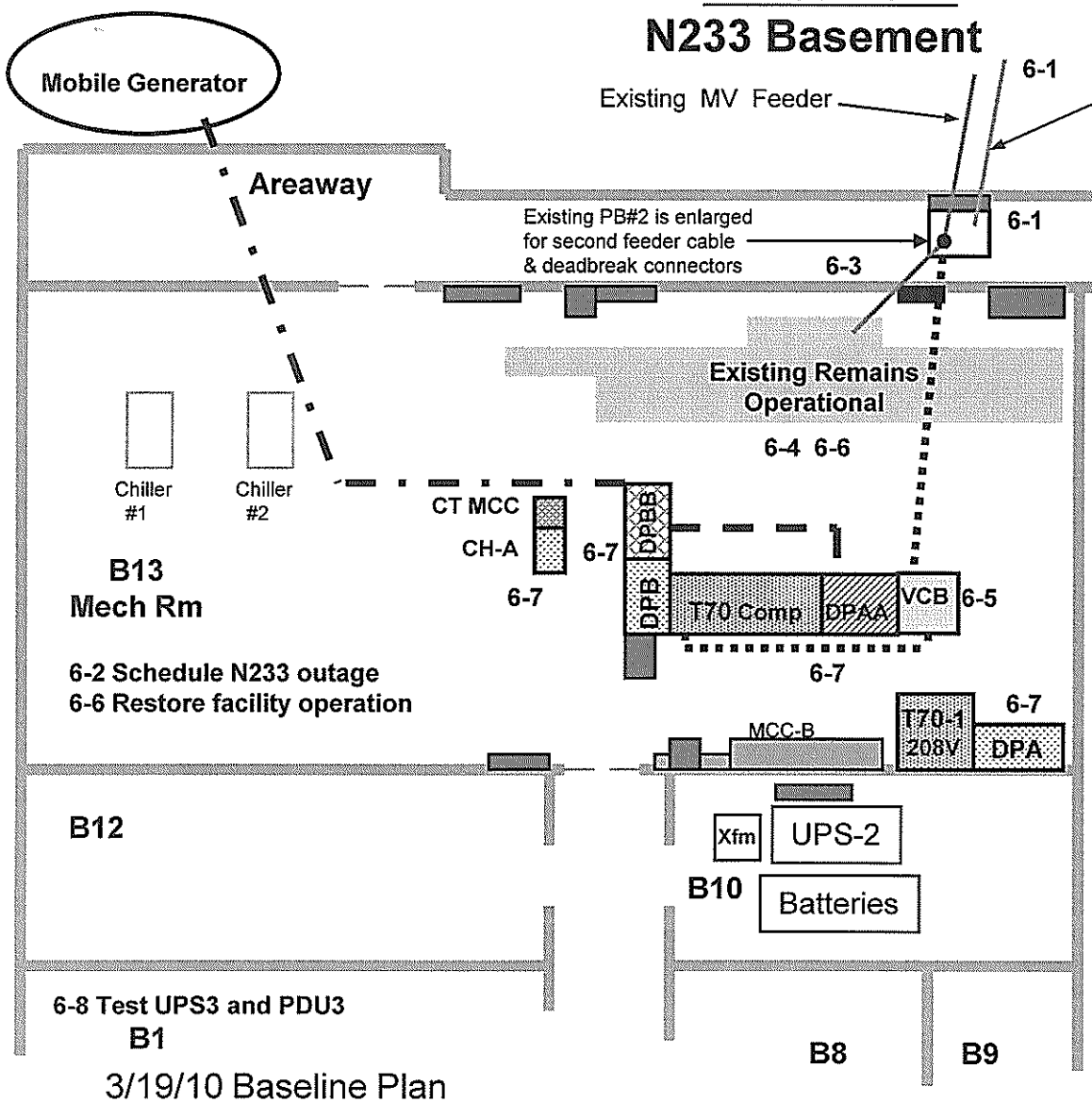
5-1 Install temporary MV circuit from enlarged MV PB#2 to temporary VCB and install deadbreak connectors at MVPB#2 end of temporary circuit. Prepare for cutover at a later time.
5-2 Install temporary MV circuit from temporary VCB to T70.
5-3 HiPot test all new MV circuits and VCB.
5-4 Install temporary 480V circuit from DPAA to DPBB.
5-5 Install Temporary 480V circuit from DPBB to mobile generator location.
5-6 HiPot test new 480V circuits.
5-7 Install mobile generator, test for operation, and connect to temporary circuit to DPBB

3/19/10 Baseline Plan

Phase 6: Install New MV Feeder & Energize New T70 & T70-1

Sheet 1 of 2

N233 Basement



3/19/10 Baseline Plan

Phase 6: Install New MV Feeder & Energize New T70 & T70-1

6-1 Install new MV feeder segment from MH150 to N233 MV PB#2 and perform HiPot test and secure. See sheet 2 for continuation.

6-2 Schedule N233 facility outage. During N233 outage, pull in remainder of new MV feeder from MH150 to the MVATS, perform HiPot tests and secure cable in MVATS un-terminated. See sheet 2.

6-3 During N233 outage, install deadbreak connectors on existing MV feeder at MVPB#2 and connect temporary MV circuit so that existing feeder will concurrently supply both the existing plant and the new temporary VCB. Perform pre-energization tests.

6-4 During N233 outage, re-energize MV feeder and test existing substations.

6-5 During N233 outage, energize, the new T70 and verify operation.

6-6 Re-energize N233 facility and restore operation of IT systems

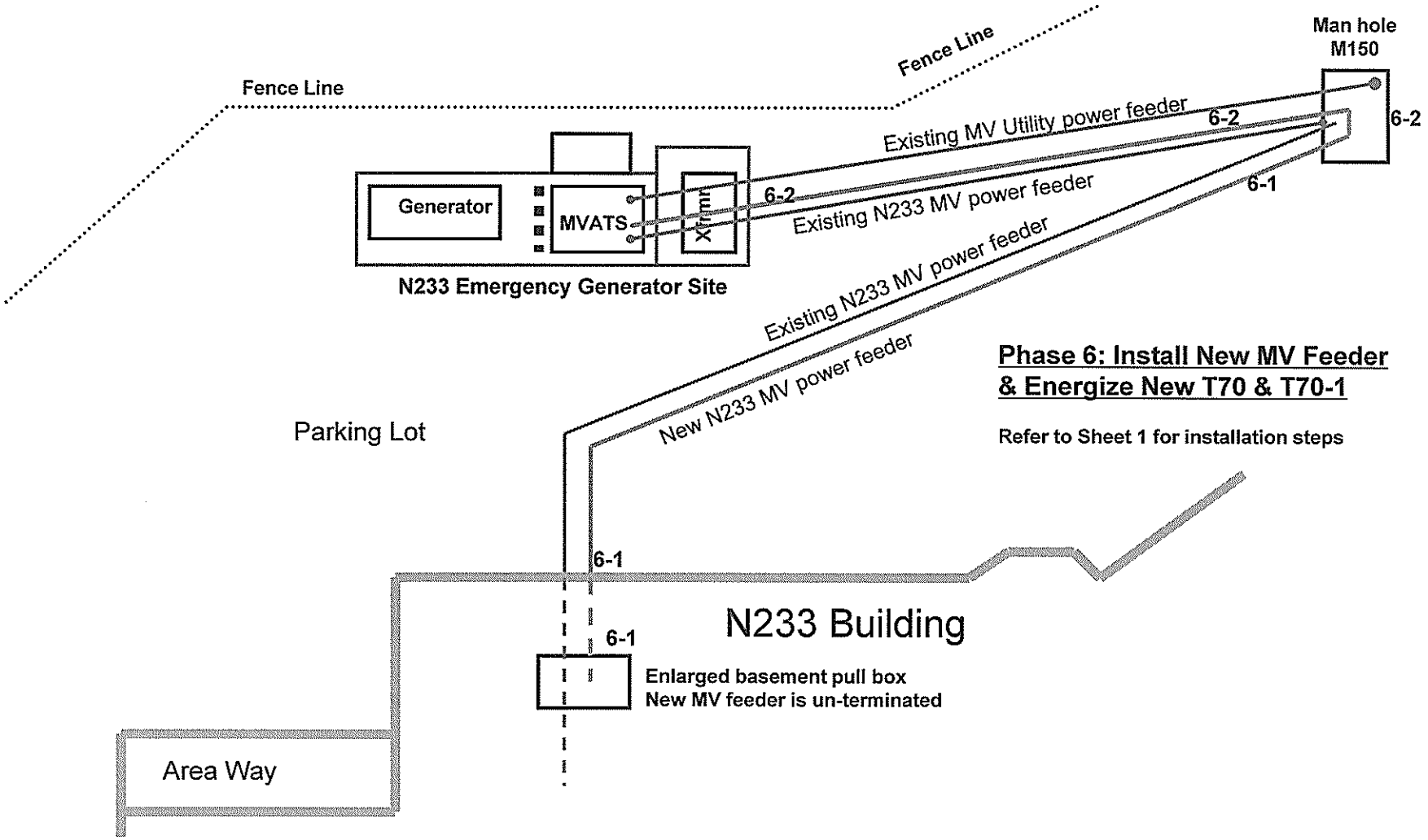
6-7 Energize T70-1 and DPAA, DPA, DPBB, DPB, CHA, and CT-MCC and burn-in for one week.

6-8 Additive #2: Energize and test new UPS#3 and PDU#3 according to specifications.

Building Outage: 1 Partial: 0

Phase 6: Install New MV Feeder & Energize New T70 & T70-1

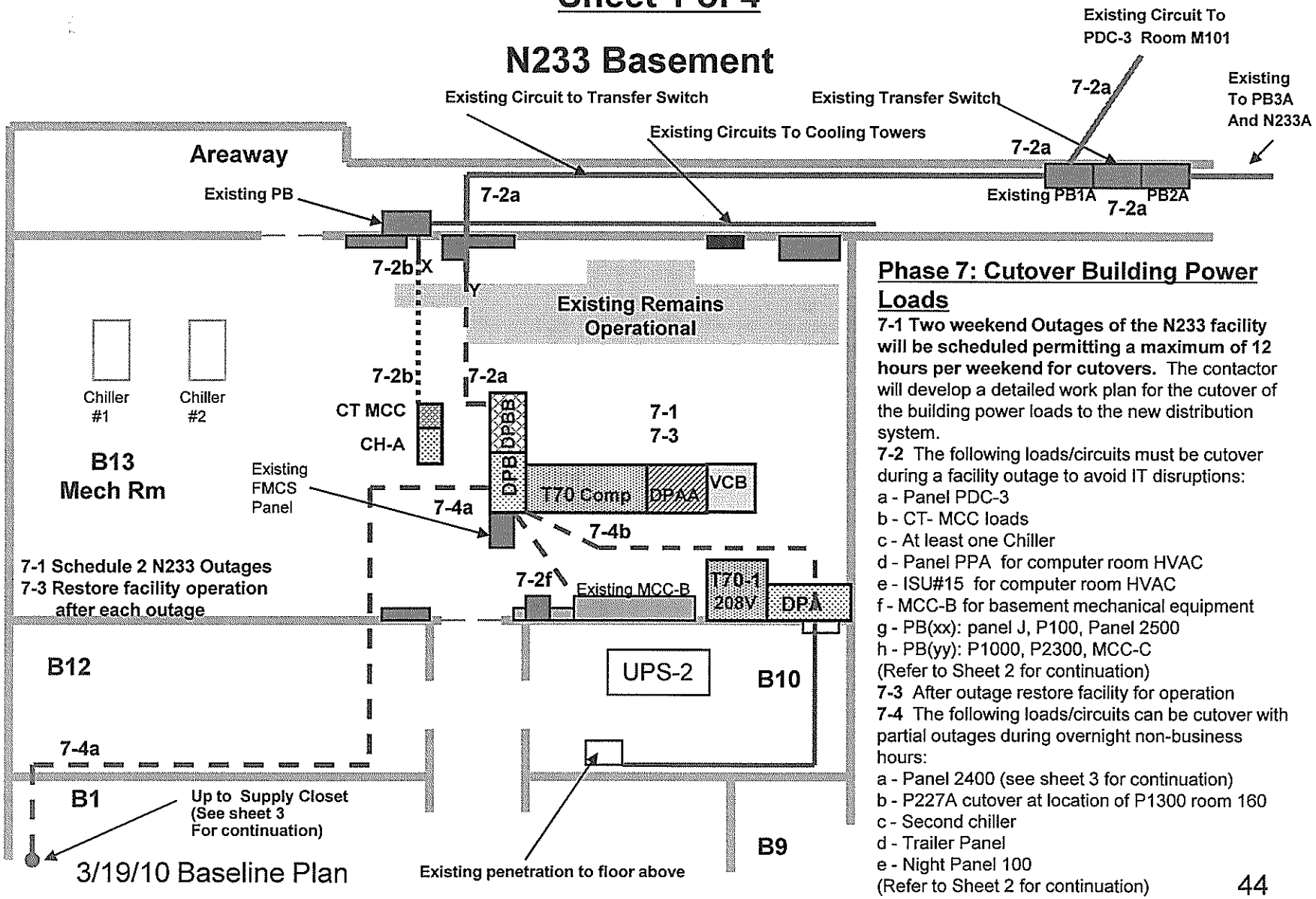
Sheet 2 of 2



3/19/10 Baseline Plan

Phase 7: Cutover Building Power Loads

Sheet 1 of 4



Phase 7: Cutover Building Power Loads

7-1 Two weekend Outages of the N233 facility will be scheduled permitting a maximum of 12 hours per weekend for cutovers. The contactor will develop a detailed work plan for the cutover of the building power loads to the new distribution system.

7-2 The following loads/circuits must be cutover during a facility outage to avoid IT disruptions:

a - Panel PDC-3
b - CT- MCC loads
c - At least one Chiller
d - Panel PPA for computer room HVAC
e - ISU#15 for computer room HVAC
f - MCC-B for basement mechanical equipment
g - PB(xx): panel J, P100, Panel 2500
h - PB(yy): P1000, P2300, MCC-C
(Refer to Sheet 2 for continuation)

7-3 After outage restore facility for operation

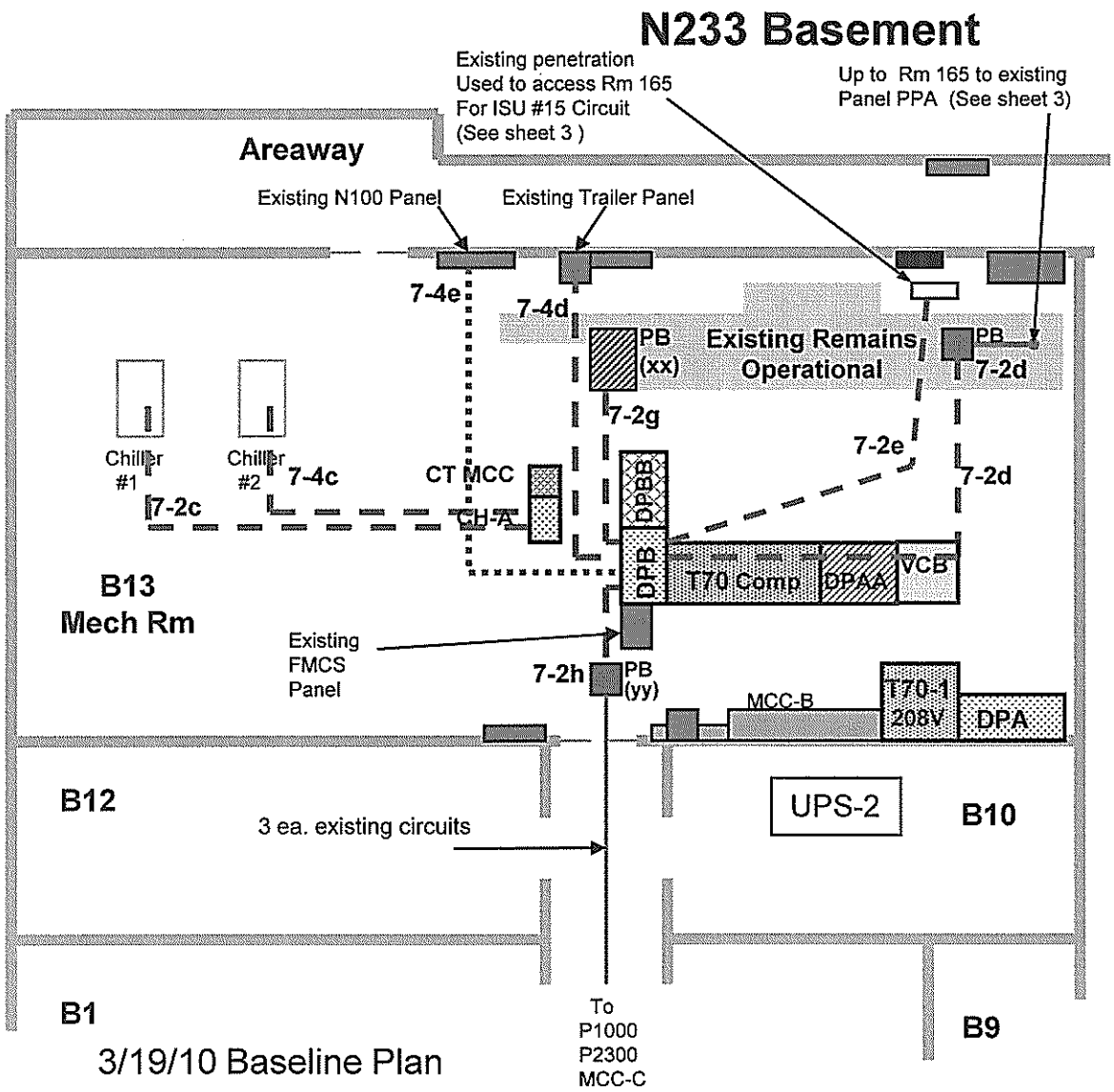
7-4 The following loads/circuits can be cutover with partial outages during overnight non-business hours:

a - Panel 2400 (see sheet 3 for continuation)
b - P227A cutover at location of P1300 room 160
c - Second chiller
d - Trailer Panel
e - Night Panel 100
(Refer to Sheet 2 for continuation)

Building Outage: 2 Partial: 3 (approx)

Phase Phase 7: Cutover Building Power Loads

Sheet 2 of 4



Phase 7: Cutover Building Power Loads

Refer to Sheets 1 and 3 for continuation
Sheet 1 cutover description is duplicated below:

7-2 The following loads/circuits must be cutover during a facility outage to avoid IT disruptions:
a - Panel PDC-3
b - CT- MCC loads
c - At least one Chiller
d - Panel PPA for computer room HVAC
e - ISU#15 for computer room HVAC
f - MCC-B for basement mechanical equipment
g - PB(xx): panel J, P100, Panel 2500
h - PB(yy): P1000, P2300, MCC-C
(Refer to Sheet 2 for continuation)
7-3 After outage restore facility for operation
7-4 The following loads/circuits can be cutover with partial outages during overnight non-business hours:
a - Panel 2400 (see sheet 3 for continuation)
b - P227A cutover at location of P1300 room 160
c - Second chiller
d - Trailer Panel
e - Night Panel 100
(Refer to Sheet 1 for continuation)