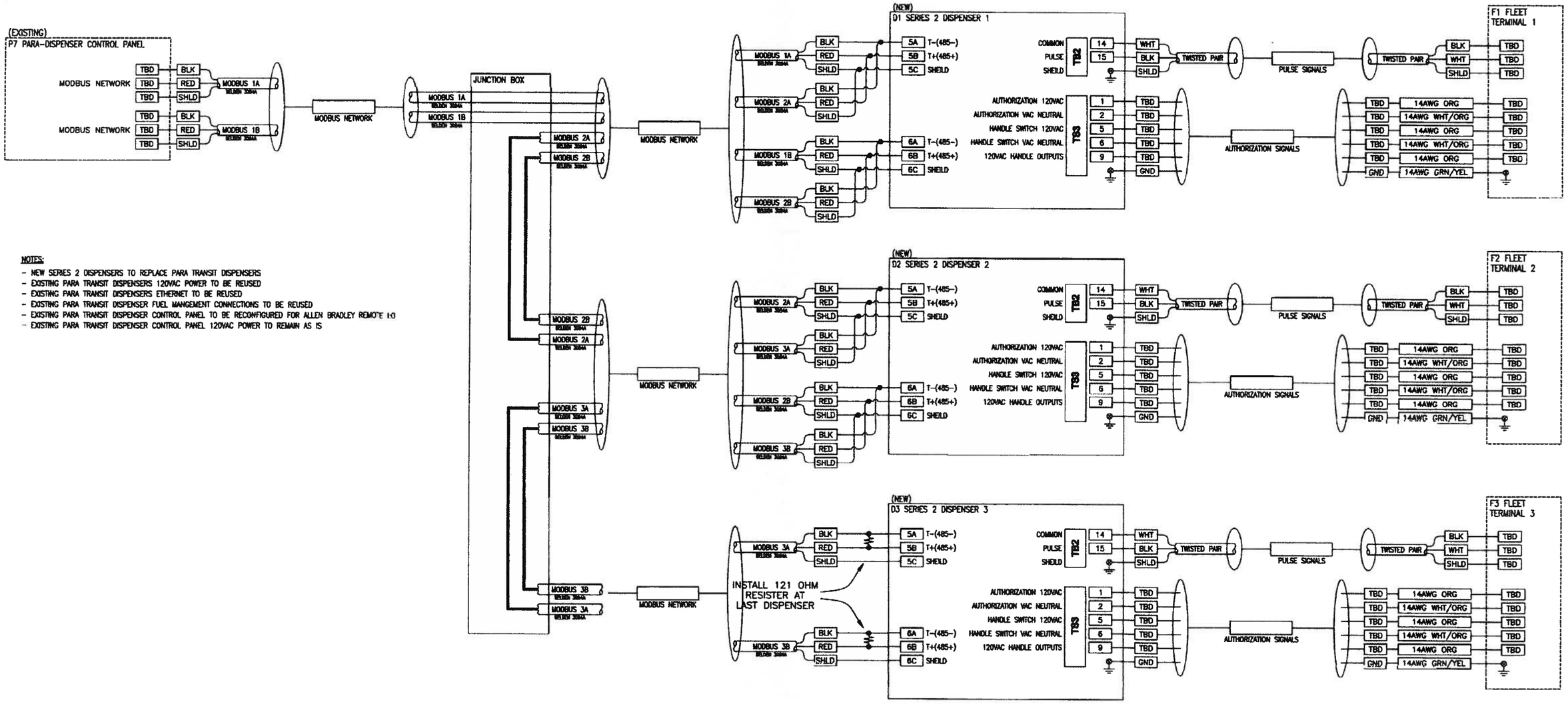
NEW SERIES 2 DISPENSER MODBUS NETWORK / FUEL MANAGEMENT INTERCONNECT



NOTES:

- NEW SERIES 2 DISPENSERS TO REPLACE PARA TRANSIT DISPENSERS
- EXISTING PARA TRANSIT DISPENSERS 120VAC POWER TO BE REUSED
- EXISTING PARA TRANSIT DISPENSERS ETHERNET TO BE REUSED
- EXISTING PARA TRANSIT DISPENSER FUEL MANGEMENT CONNECTIONS TO BE REUSED
- EXISTING PARA TRANSIT DISPENSER CONTROL PANEL TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I/O
- EXISTING PARA TRANSIT DISPENSER CONTROL PANEL 120VAC POWER TO REMAIN AS IS

ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO			
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION			
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
A	12/16/16 MWS	INITIAL RELEASE	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

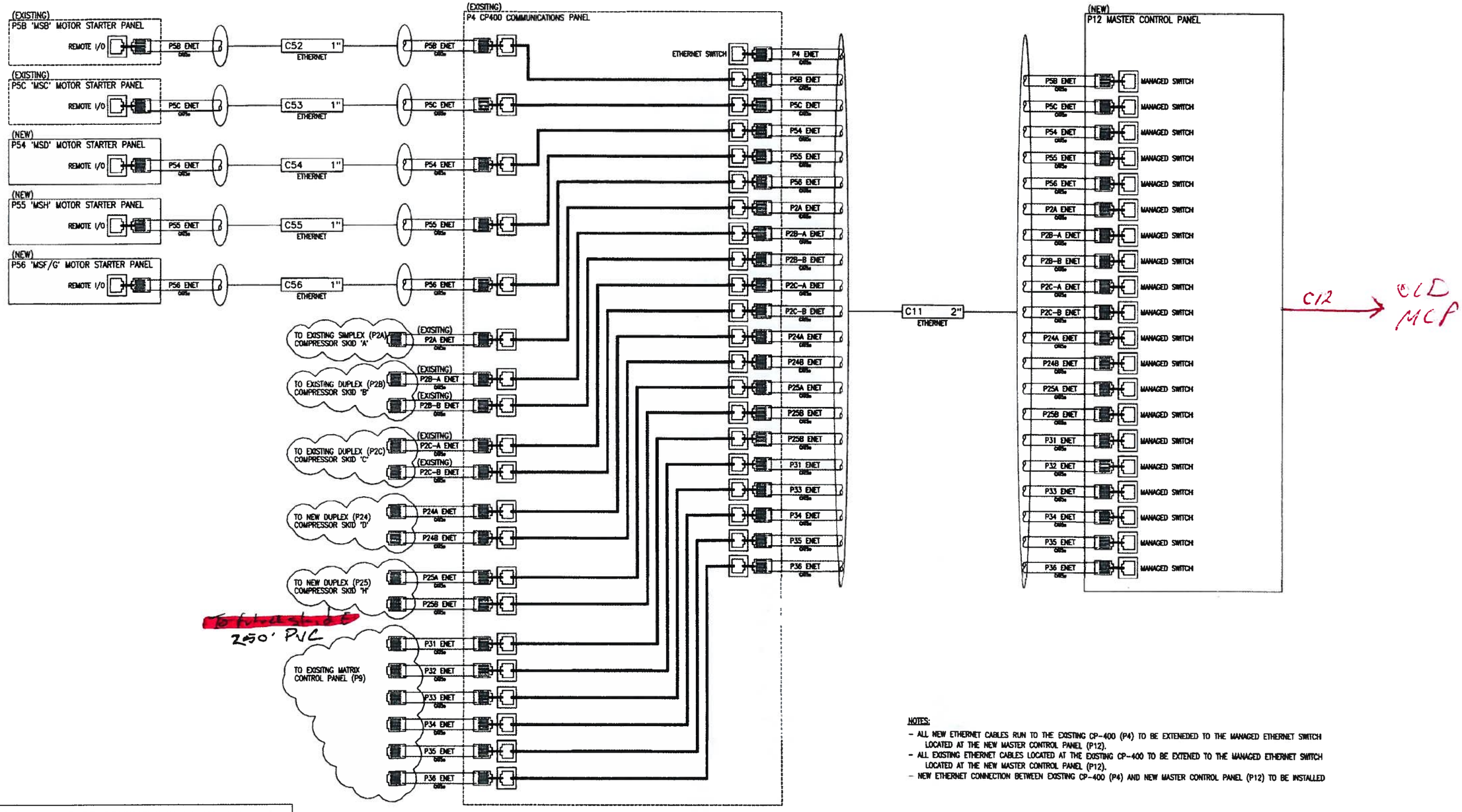
ANGI ENERGY SYSTEMS
305 W DELAVAN DR
JANESVILLE, WI 53546
PH: 608-563-2800
www.angienergy.com

CONTROLLED DRAWING

THIS DRAWING COMPLIES WITH AGENCY LISTINGS. DO NOT CHANGE WITHOUT APPROVAL FROM ENGINEERING DEPARTMENT.

TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS NEW SERIES 2 DISPENSER MODBUS NETWORK/FUEL MANAGEMENT INTERCONNECT		
CUSTOMER	Trillium - RTC Las Vegas - IBMF	PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A	DRAWING NO. A80-50-50453 REV. F
CHK -	DATE -	SHT 12 TOT 14	

SITE ETHERNET INTERCONNECTION



ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

NOTES:
- ALL NEW ETHERNET CABLES RUN TO THE EXISTING CP-400 (P4) TO BE EXTENEDED TO THE MANAGED ETHERNET SWITCH LOCATED AT THE NEW MASTER CONTROL PANEL (P12).
- ALL EXISTING ETHERNET CABLES LOCATED AT THE EXISTING CP-400 TO BE EXTENED TO THE MANAGED ETHERNET SWITCH LOCATED AT THE NEW MASTER CONTROL PANEL (P12).
- NEW ETHERNET CONNECTION BETWEEN EXISTING CP-400 (P4) AND NEW MASTER CONTROL PANEL (P12) TO BE INSTALLED

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO			
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION			
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
A	12/16/16 MWS	INITIAL RELEASE	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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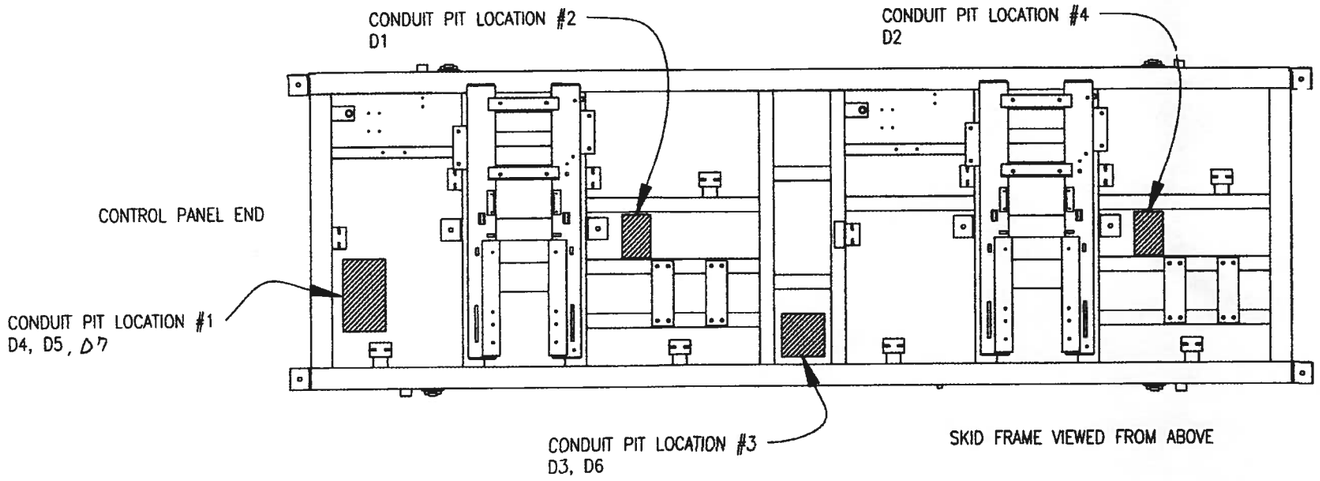
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
SITE ETHERNET INTERCONNECTION

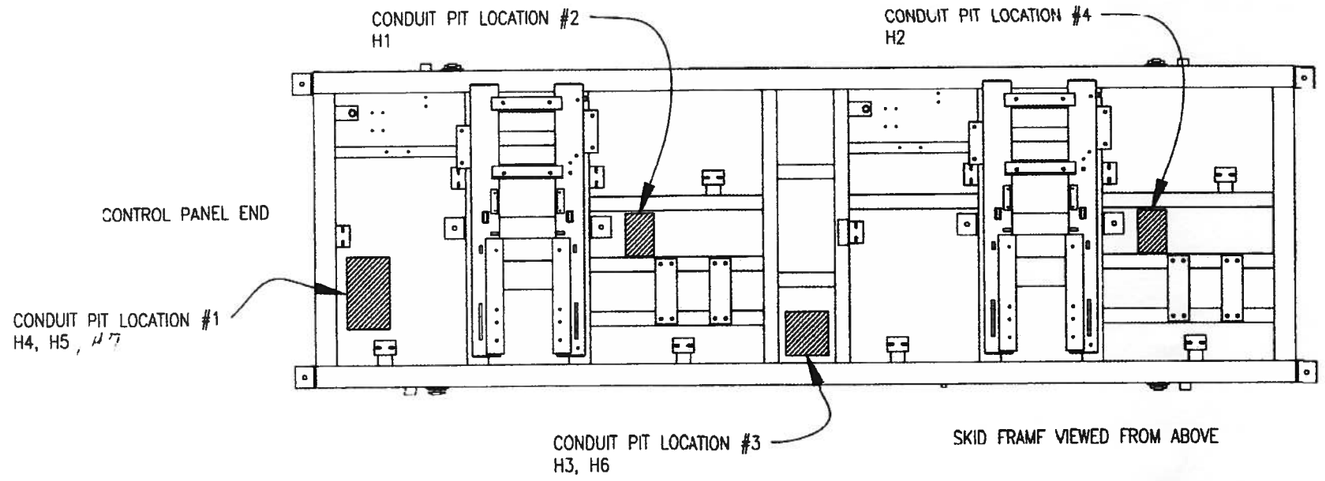
CUSTOMER: Trillium - RTC Las Vegas - IBMF
PROJECT NO.: 50453
DRN: MWS
DATE: 11/18/16
SCALE: N/A
DRAWING NO.: A80-50-50453
REV.: F
CHK: _
DATE: _
SHT: 13
TOT: 14

NEW COMPRESSOR DUPLEX SKID 'D' (P24)

FOR PIT LOCATION DIMENSTIONS, REFER TO DWG# A05-10-ED-PIT-NO_ENC_3



NEW COMPRESSOR DUPLEX SKID 'H' (P25)



REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO			
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION			
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
A	12/16/16 MWS	INITIAL RELEASE	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS NEW COMPRESSOR PIT LOCATIONS/CONDUIT CALL OUT				
CUSTOMER	Trillium – RTC Las Vegas – IBMF			PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A		DRAWING NO.	REV.
CHK –	DATE –	SHT 14	TOT 14	A80-50-50453	F

WHITING-TURNER

Request For Information

The Whiting-Turner Contracting Company
6720 Via Austi Parkway Suite 300
Las Vegas NV 89119
TEL: (702) 650-0700 FAX: (702) 650-2650

TO: RTC of Southern Nevada 600 S. Grand Central Pkwy. Ste. 350 Las Vegas NV 89106 **ATTN:** Evan Wade	**Date:** 02/23/2017 **RFI#:** 0061 **Forwarded As:** **RTC CNG Fueling Infrastructure** **W-T Job Number** 015810.100 5165 W. Sunset Road Las Vegas NV 89118 Tel:(702) 650-0700 Fax:(702) 650-2650
FROM: The Whiting-Turner Contracting Company Daniel Miller 6720 Via Austi Parkway Suite 300 Las Vegas NV 89119	**Subject:** IBMF - Existing Ductbank **Source:** **Discipline:** Electrical

CC:

Company Name	Contact Name	Notes

Related Objects:

Question **Date Required: 02/27/2017**

Please reference attached sheet 1E-102. The existing ductbank north of existing skids B & C was supposed to contain 4" spare conduits. Note 4 states to extend the existing 4" conduits to feed skids G & H. This ductbank is also to be used for future skids E & F. The ductbank was exposed on the east end and it was discovered that there are no 4" spare conduits, only 3", 1", and ¾" conduits (see attached picture). For all 4" conduits that were to tie into this ductbank, please advise on how to proceed.

Suggestion

Cost Impact	Cost Amount	Schedule Impact	Days
Potentially		Potentially	

No Suggestion Provided

Notes

Answer **Date Answered:**

Cost Impact	Cost Amount	Schedule Impact	Days
Potentially		Potentially	

Fuel Solutions response (based on the RFI and on follow-up field information from W-T)

- The feeders to D, E, H will fit in the 3" conduits (2 to each).
- Ground wire will change from #1 to #2. The Fan/Lube/Heater wiring conduit can go in a 1.5" conduit.
- Feeders for F and G will change from (2) 4" each to (2) 3" and (1) 1.5" each.
- This will use (10) of the (16) 3" conduits available.
- (1) additional 3" conduit will be needed for the dryer circuit.
- See attached markups to 1E-601 and 1E-602 (original submittal attachments removed to reduce file size).

- Reb Guthrie
Project Manager
3-7-17

KEYED NOTES

1. REMOVE THE CAMLOCK TERMINATION PANEL FED FROM THIS CIRCUIT BREAKER.
2. COORDINATE WITH THE MANUFACTURER TO REMOVE THE KIRK KEY ATTACHED TO THE BREAKER.
3. THIS NUMBER INDICATES WHERE THE CALCULATION FOR THIS SPECIFIC DEVICE IS FOUND IN THE PROTECTIVE DEVICE SUMMARY, SHEET 1E-501.

THE CONTRACTOR SHALL COORDINATE WITH THE MOTOR STARTER PANEL MANUFACTURER TO ENSURE ONLY ONE COMPRESSOR FROM SKID H WILL OPERATE WHEN THE SYSTEM IS ON STANDBY GENERATOR POWER.

NEW WORK

NEW WORK

RELOCATED CONTACTOR

EXISTING DRYER

INTEGRATED ATS DISTRIBUTION SWITCHBOARD CNG1

PROVIDE GROUNDING TO THE BUILDING STEEL AND WATER PIPING SYSTEMS IN ACCORDANCE WITH NEC 250.30 A.7.

2.907 in sq 40% Sch 40 3" C
4608 in sq 300kcmil
1158 in sq #2 gnd
2.88 in sq total
Less than 40% fill

1 SINGLE-LINE DIAGRAM - CNG1
SCHEMATIC

No	Revision Submissions	Date
	RFI 061 Response	03.07.17
2	ISSUED FOR CONSTRUCTION	01.23.17
1	RESPONSE TO CNLV COMMENTS	09.26.16
0	ISSUED FOR PLAN REVIEW 1	06.20.16

FUEL SOLUTIONS
5755 Uplander Way • Suite A
Culver City, CA 90230
310-207-8548

RTC of Southern Nevada
Integrated Bus Maintenance Facility

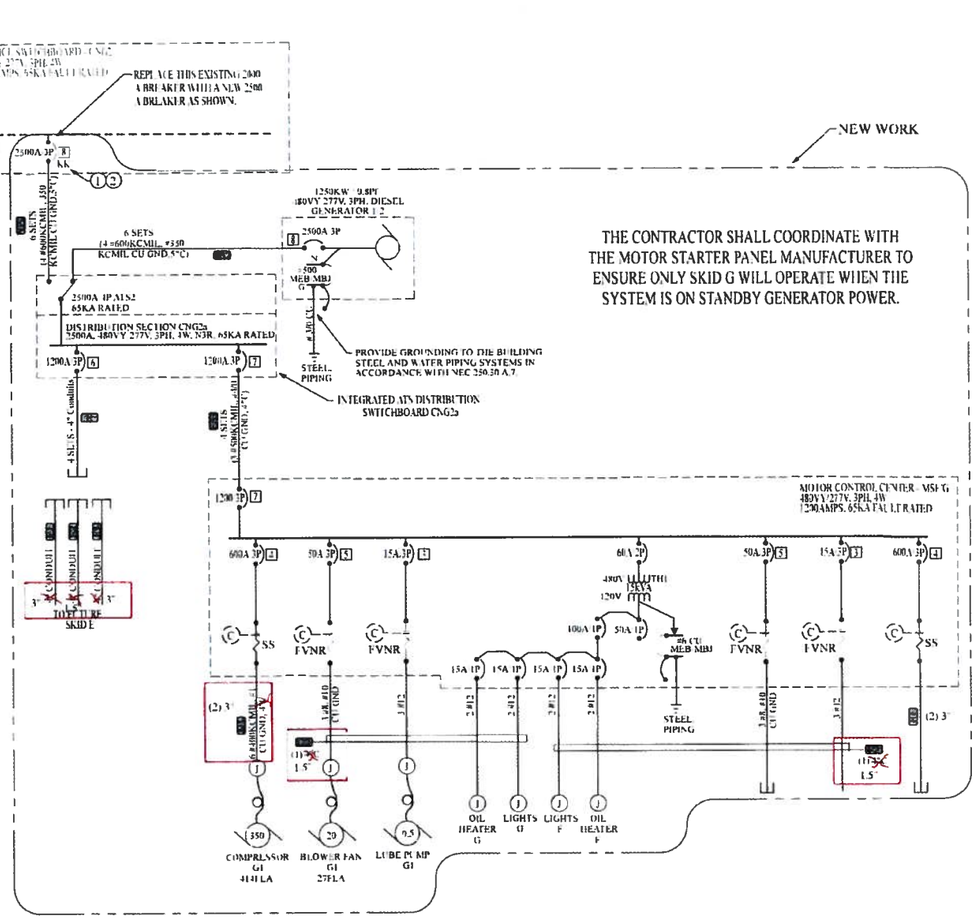
3210 Citizen Avenue
North Las Vegas, NV
89032

CNG FUELING UPGRADES - PHASE A
SCHEMATIC DIAGRAMS - CNG1

JACK E CORNELL Exp. 12-31-18 ELECTRICAL No. 11126

Designed: JLC	Project Number: N/A
Drawn: JEC	Scale: As Shown
Checked: JLC	Drawing Number: 1E-601
Reviewed: JEC	
Date: 07.15.15	

PolyPhase Engineering



THE CONTRACTOR SHALL COORDINATE WITH THE MOTOR STARTER PANEL MANUFACTURER TO ENSURE ONLY SKID G WILL OPERATE WHEN THE SYSTEM IS ON STANDBY GENERATOR POWER.

KEYED NOTES

1. REMOVE THE CAMLOCK TERMINATION PANEL FED FROM THIS CIRCUIT BREAKER.
2. COORDINATE WITH THE MANUFACTURER TO REMOVE THE KIRK KEY ATTACHED TO THE BREAKER.

A SINGLE-LINE DIAGRAM - CNG2
SCHEMATIC

RTC OF SOUTHERN NEVADA

	RFI 061 Response	03 07 17
2	ISSUED FOR CONSTRUCTION	01 23 17
1	RESPONSE TO CNLV COMMENTS	09 26 16
0	ISSUED FOR PLAN REVIEW 1	06 20 16
No	Revision Submissions	Date

FUEL SOLUTIONS
5755 Uplander Way • Suite A
Culver City, CA 90230
310-207-8548

RTC of Southern Nevada
Integrated Bus Maintenance Facility

3210 Citizen Avenue
North Las Vegas, NV
89032

CNG FUELING UPGRADES - PHASE A
SCHEMATIC DIAGRAMS - CNG2

Designed: JLC	Project Number: N.A.
Drawn: JLC	Scale: As Shown
Checked: JEC	Drawing Number: 1E-602
Reviewed: JEC	
Date: 07.15.15	

PolyPhase Engineering

JACK E. CORNELL — Exp. 12/31/16 — ELECTRICAL — No. 11726

4/7/17

ANGI

DRAWING INDEX

SHEET	DESCRIPTION
1	INDEX AND GENERAL INFORMATION
2	EXISTING DUPLEX COMPRESSOR SKID 'A' UPGRADE/INTERCONNECT
3	EXISITNG DUPLEX SKID 'B'/DUPLEX SKID 'C' UPGRADE/INTERCONNECT
4	NEW DUPLEX SKID 'D'/MOTOR STARTER PANEL 'MSD' INTERCONNECT
5	NEW DUPLEX SKID 'H'/MOTOR STARTER PANEL 'MSH' INTERCONNECT
6	NEW SIMPLEX SKID 'G'/MOTOR STARTER PANEL 'MSF/G' INTERCONNECT
7	EXISTING MATRIX CONTROL PANEL UPGRADE/INTERCONNECT
8	EXISTING MATRIX CONTROL PANEL UPGRADE/INTERCONNECT (CONTINUED)
9	EXISTING FLEET CONTROL PANEL/NEW PLC DISPENSER INTERCONNET
10	NEW PLC DISPENSERS 11, 12 MODBUS AND ETHERNET INTERCONNECT
11	NEW PLC DISPENSERS 11, 12 POWER/ESD/FUEL MANAGEMENT INTERCONNECT
12	NEW SERIES 2 DISPENSER MODBUS NETWORK/FUEL MANAGEMENT INTERCONNECT
13	SITE ETHERNET INTERCONNECTION
14	NEW COMPRESSOR PIT LOCATIONS/CONDUIT CALL OUT

POWER TO SKIDS D & H - APROX. 5/30 - 5/12 (DISP 11/12) - 5/22 D
POWER TO SKID G - APROX. 7/5 - 7/5 - 7/11 5/23 - 6/2 H
LV CABLE PULLED D&H - APROX. 5/22 - 5/12
LV CABLE PULLED TO G - 6/30 -

EQUIPMENT LEGEND

CODE	PANEL DESCRIPTION
	– NEW EQUIPMENT –
P11	MASTER CONTROL PANEL
P24	DUPLEX COMPRESSOR SKID 'D'
P25	DUPLEX COMPRESSOR SKID 'H'
P34	MATRIX PANEL 'D' INTERFACE JUNCTION BOX
P35	MATRIX PANEL 'H' INTERFACE JUNCTION BOX
P36	MATRIX PANEL 'F/G' INTERFACE JUNCTION BOX
P54	MOTOR STARTER PANEL 'MSD' – DUAL 300HP
P55	MOTOR STARTER PANEL 'MSH' – DUAL 300HP
P56	MOTOR STARTER PANEL 'MSF/G' – DUAL 350HP
D11	PLC DISPENSER
D12	PLC DISPENSER
D13	SERIES 2 DISPENSER
D14	SERIES 2 DISPENSER
D15	SERIES 2 DISPENSER
	– RELOCATED EQUIPMENT (FROM SMF) –
P26	SIMPLEX COMPRESSOR SKID 'G'
	– EXISTING EQUIPMENT TO BE UPGRADED (REMOTE I:O)–
P2A	DUPLEX COMPRESSOR SKID 'A'
P5A	MOTOR STARTER PANEL 'MSA'
P2B	DUPLEX COMPRESSOR SKID 'B'
P5B	MOTOR STARTER PANEL 'MSB'
P2C	DUPLEX COMPRESSOR SKID 'C'
P5C	MOTOR STARTER PANEL 'MSC'
P9	MATRIX CONTROL PANEL
P6	FLEET DISPENSER CONTROL PANEL
P7	PARA–DISPENSER CONTROL PANEL
	– EXISTING EQUIPMENT –
P01	UPS PANEL
P4	CP400 COMMUNICATIONS PANEL

ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE–LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION
B	12/28/16 MWS	CUSTOMER MARKUPS
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES
H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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PH: 608–563–2800
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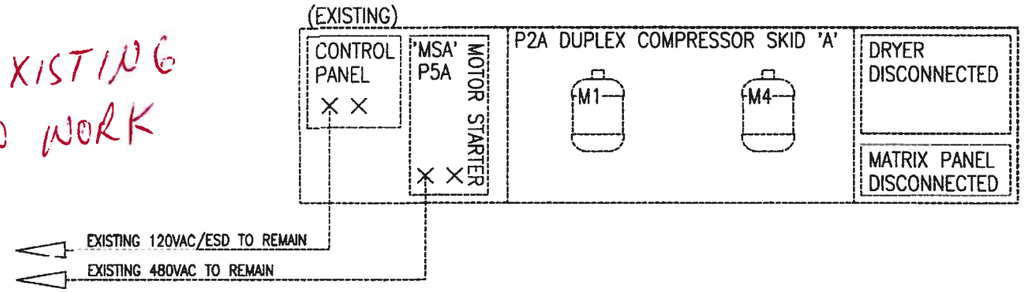
TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS INDEX AND GENERAL INFORMATION
CUSTOMER	Trillium – RTC Las Vegas – IBMF
PROJECT NO.	50453
DRN MWS	DATE 11/18/16
CHK –	DATE –
SCALE	N/A
SHT 1	TOT 14
DRAWING NO.	A80–50–50453
REV.	J

EXISTING DUPLEX COMPRESSOR SKID 'A' UPGRADE/INTERCONNECT

EXISTING
NO WORK



NOTES:

- RUN/ RUNNING SIGNALS TO BE REMOVED BETWEEN COMPRESSOR SKID 'A' (P2A) CONTROL PANEL AND MCTOR STARTFR PANFI 'MSA' (P5A)
- CsCAN NETWORK TO COMPRESSOR SKID 'A' CONTROL PANEL (P2A) TO BE REMOVED
- COMPRESSOR SKID 'A' CONTROL PANEL (P2A) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O
- MOTOR STARTER PANEL 'MSA' (P5A) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O
  (RUN/RUNNING SIGNALS TO BE WIRED TO NEW 'MSA' (P5A) REMOTE I:O)

REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION
B	12/28/16 MWS	CUSTOMER MARKUPS
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES

REV	DATE/BY	DESCRIPTION
H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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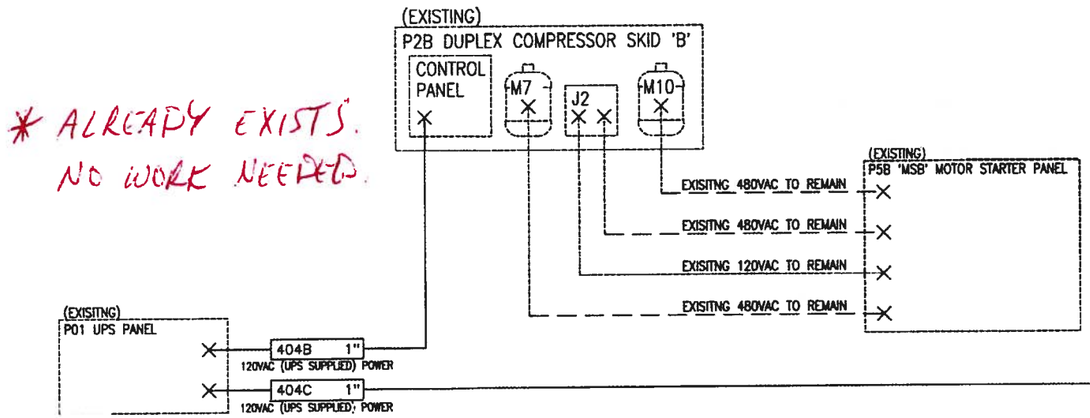
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
EXISTING DUPLEX COMPRESSOR SKID 'A' UPGRADE/INTERCONNECT

CUSTOMER: Trillium – RTC Las Vegas – IBMF
PROJECT NO.: 50453
DRN: MWS
DATE: 11/18/16
SCALE: N/A
DRAWING NO.: A80-50-50453
REV.: J
CHK: –
DATE: –
SHT: 2
TOT: 14

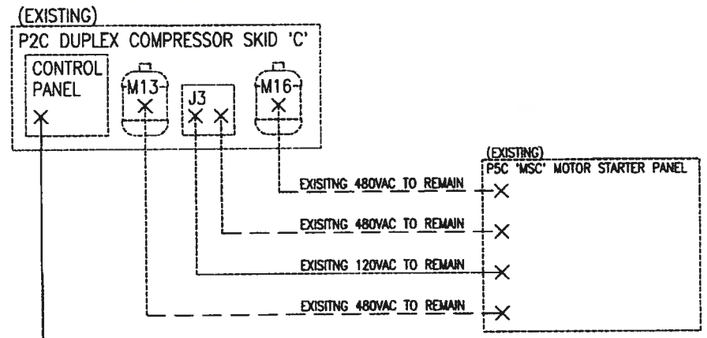
EXISTING DUPLEX COMPRESSOR SKID 'B' UPGRADE/INTERCONNECT



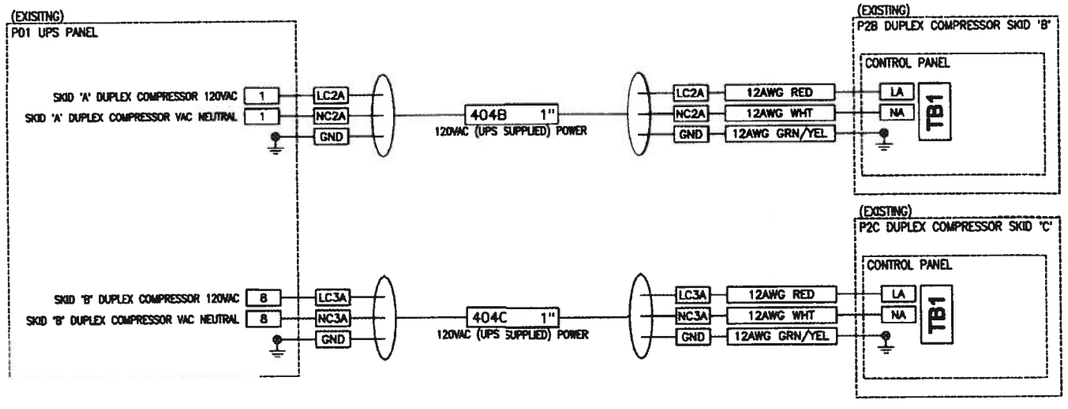
* ALREADY EXISTS. NO WORK NEEDED.

NOTES:
- RUN/ RUNNING SIGNALS TO BE REMOVED BETWEEN COMPRESSOR SKID 'B' CONTROL PANEL (P2B) AND MOTOR STARTER PANEL 'MSB' (P5B)
- CsCAN NETWORK TO COMPRESSOR SKID 'B' CONTROL PANEL (P2B) TO BE REMOVED
- COMPRESSOR SKID 'B' CONTROL PANEL (P2B) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O
- MOTOR STARTER PANEL 'MSB' (P5B) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O (RUN/RUNNING SIGNALS TO BE WIRED TO NEW 'MSB' (P5B) REMOTE I:O)
- 120VAC POWER TO BE SUPPLIED FROM EXISTING UPS PANEL. (SEE NOTE #1 OF FUEL SOLUTIONS DRAWING 1E-501)

EXISTING DUPLEX COMPRESSOR SKID 'C' UPGRADE/INTERCONNECT



NOTES:
- RUN/ RUNNING SIGNALS TO BE REMOVED BETWEEN COMPRESSOR SKID 'C' CONTROL PANEL (P2C) AND MOTOR STARTER PANEL 'MSC' (P5C)
- CsCAN NETWORK TO COMPRESSOR SKID 'C' CONTROL PANEL (P2C) TO BE REMOVED
- COMPRESSOR SKID 'C' CONTROL PANEL (P2C) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O
- MOTOR STARTER PANEL 'MSC' (P5C) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O (RUN/RUNNING SIGNALS TO BE WIRED TO NEW 'MSC' (P5C) REMOTE I:O)
- 120VAC POWER TO BE SUPPLIED FROM EXISTING UPS PANEL



ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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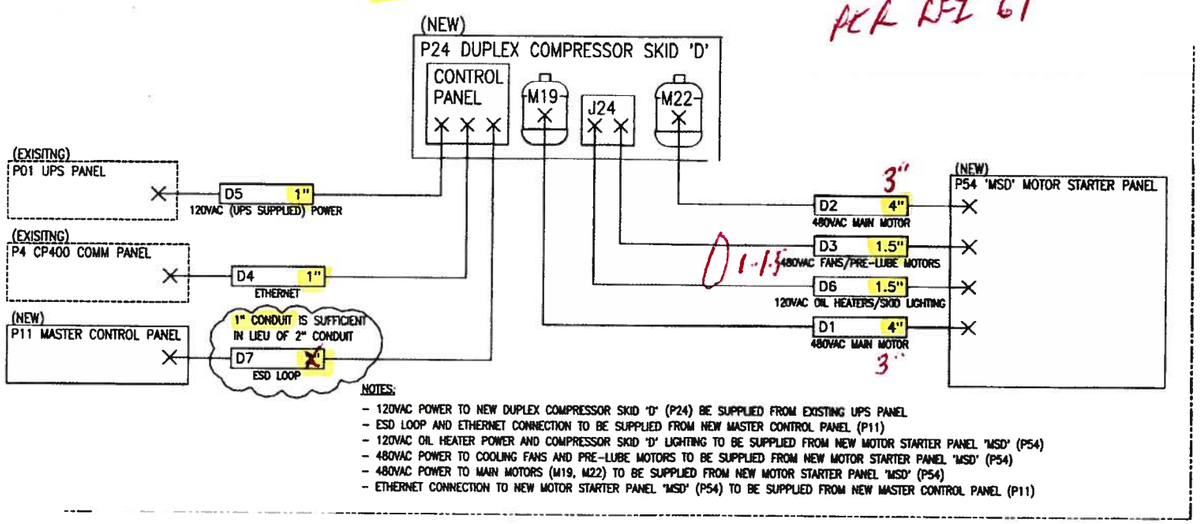
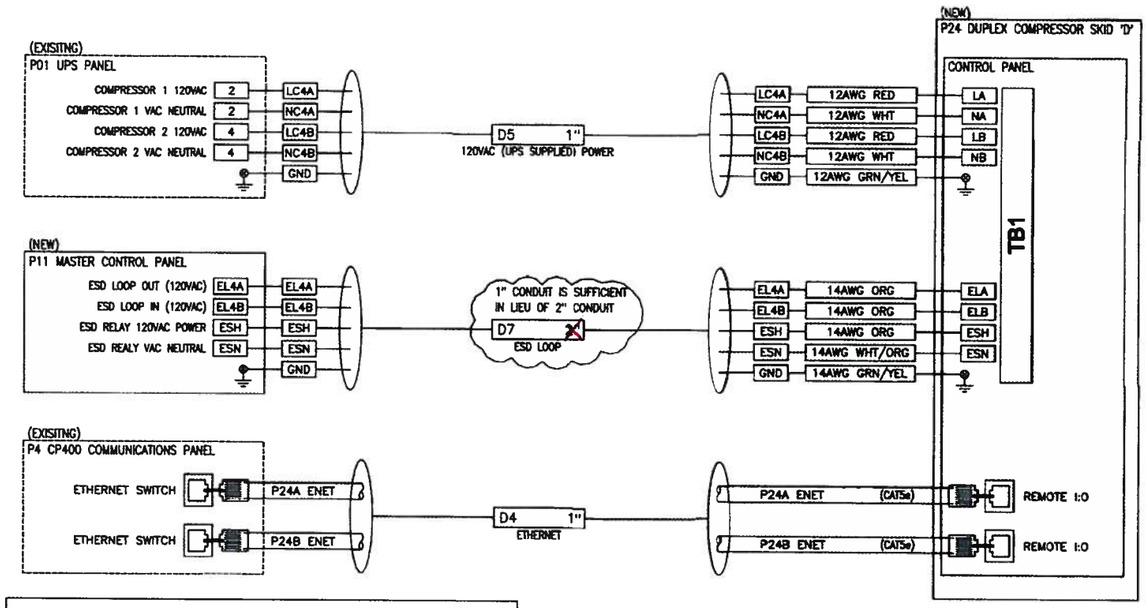
TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS EXISITNG DUPLEX SKID 'B'/DUPLEX SKID 'C' UPGRADE/INTERCONNECT
CUSTOMER	Trillium – RTC Las Vegas – IBMF
PROJECT NO.	50453
DRN MWS	DATE 11/18/16
SCALE	N/A
DRAWING NO.	A80-50-50453
REV.	J
CHK –	DATE –
SHT	3
TOT	14

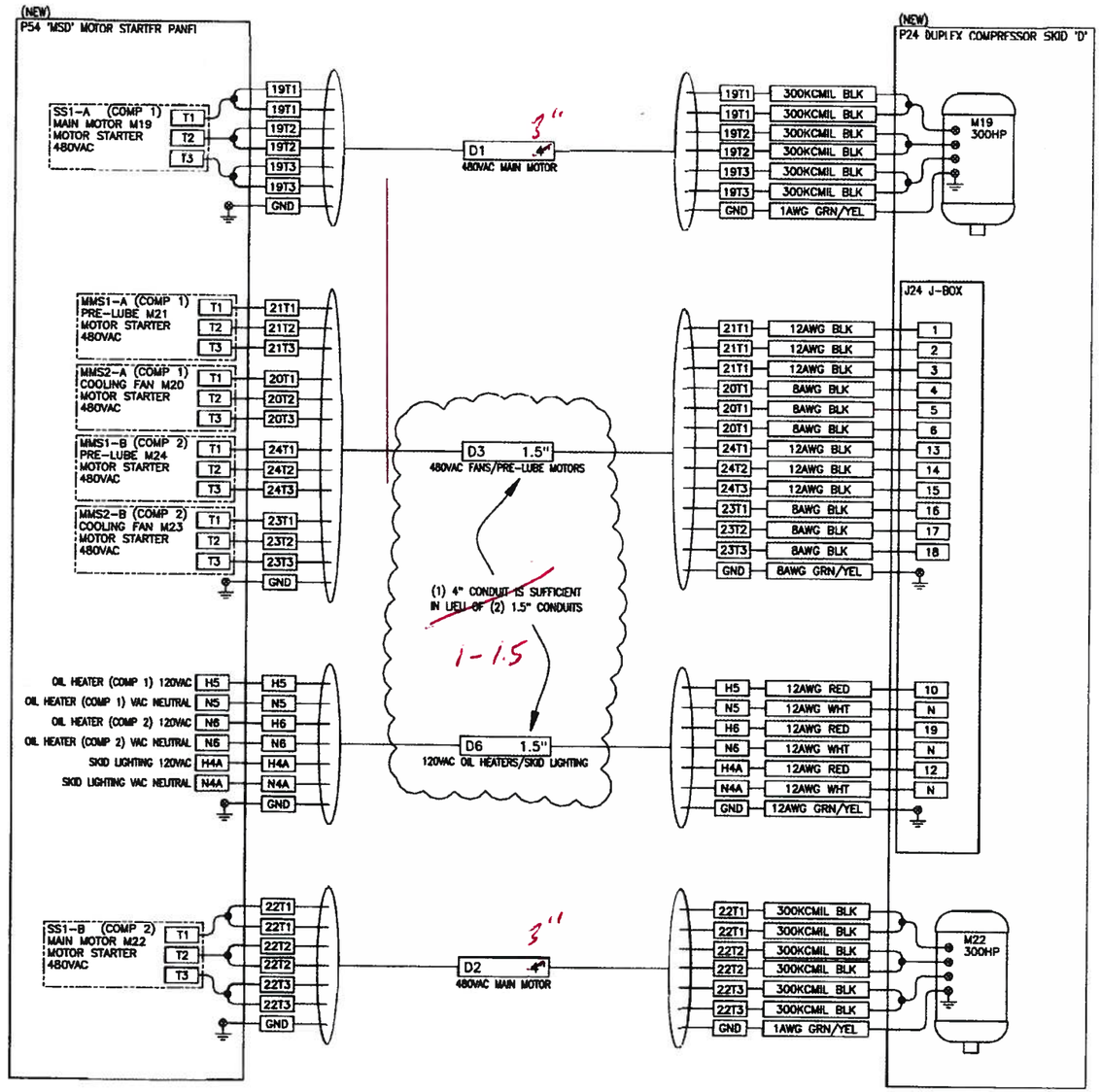
NEW DUPLEX COMPRESSOR SKID 'D' INTERCONNECT

ACR RFI 61



NOTES:
- 120VAC POWER TO NEW DUPLEX COMPRESSOR SKID 'D' (P24) BE SUPPLIED FROM EXISTING UPS PANEL
- ESD LOOP AND ETHERNET CONNECTION TO BE SUPPLIED FROM NEW MASTER CONTROL PANEL (P11)
- 120VAC OIL HEATER POWER AND COMPRESSOR SKID 'D' LIGHTING TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSD' (P54)
- 480VAC POWER TO COOLING FANS AND PRE-LUBE MOTORS TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSD' (P54)
- 480VAC POWER TO MAIN MOTORS (M19, M22) TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSD' (P54)
- ETHERNET CONNECTION TO NEW MOTOR STARTER PANEL 'MSD' (P54) TO BE SUPPLIED FROM NEW MASTER CONTROL PANEL (P11)





ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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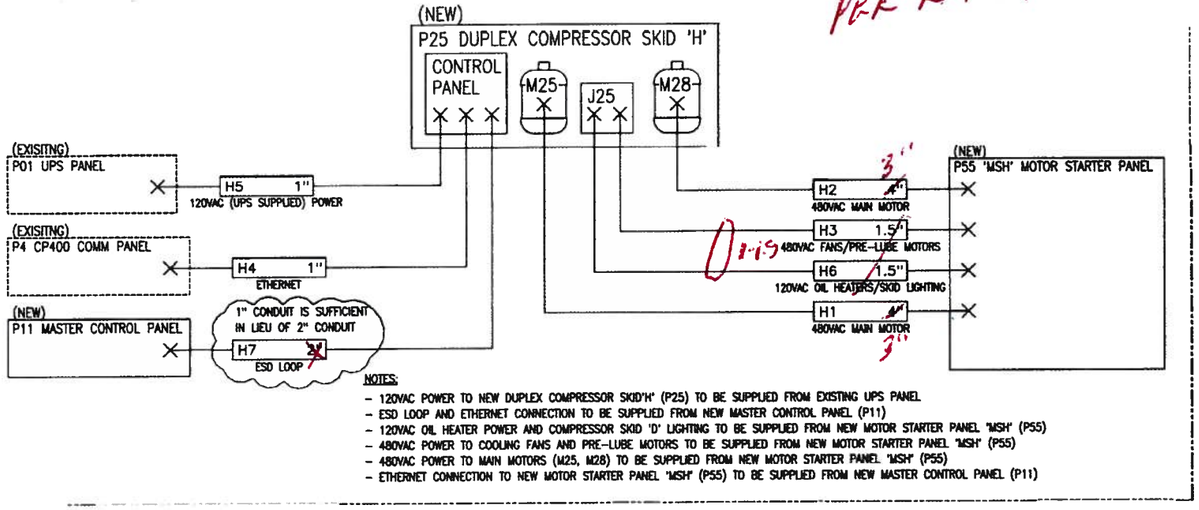
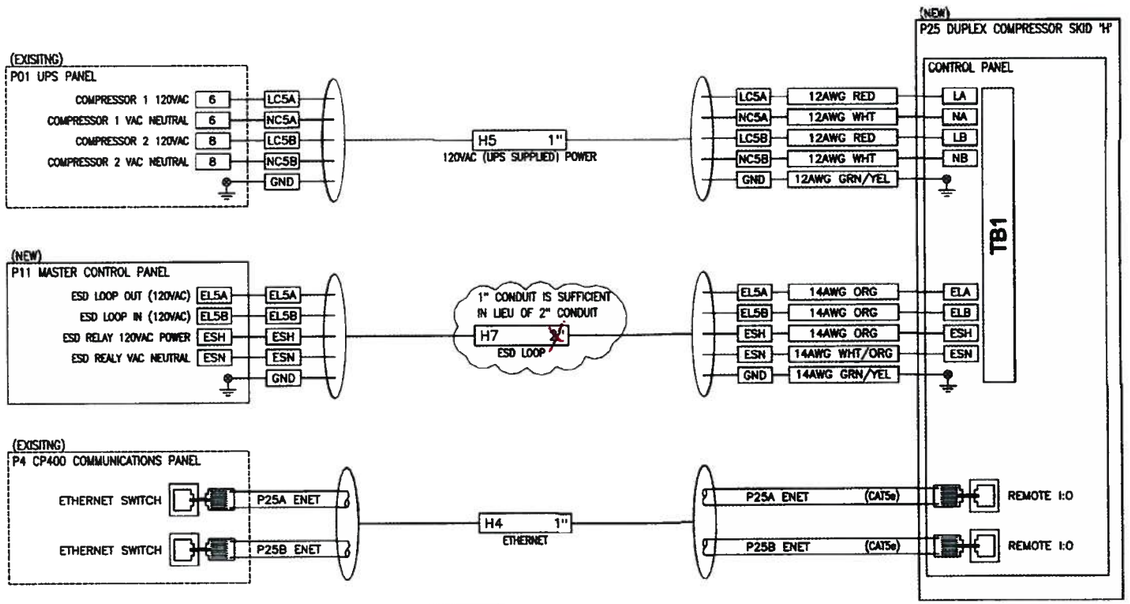
TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS NEW DUPLEX SKID 'D'/MOTOR STARTER PANEL 'MSD' INTERCONNECT		
CUSTOMER	Trillium – RTC Las Vegas – IBMF	PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A	DRAWING NO. A80-50-50453
CHK –	DATE –	SHT 4 TOT 14	REV. J

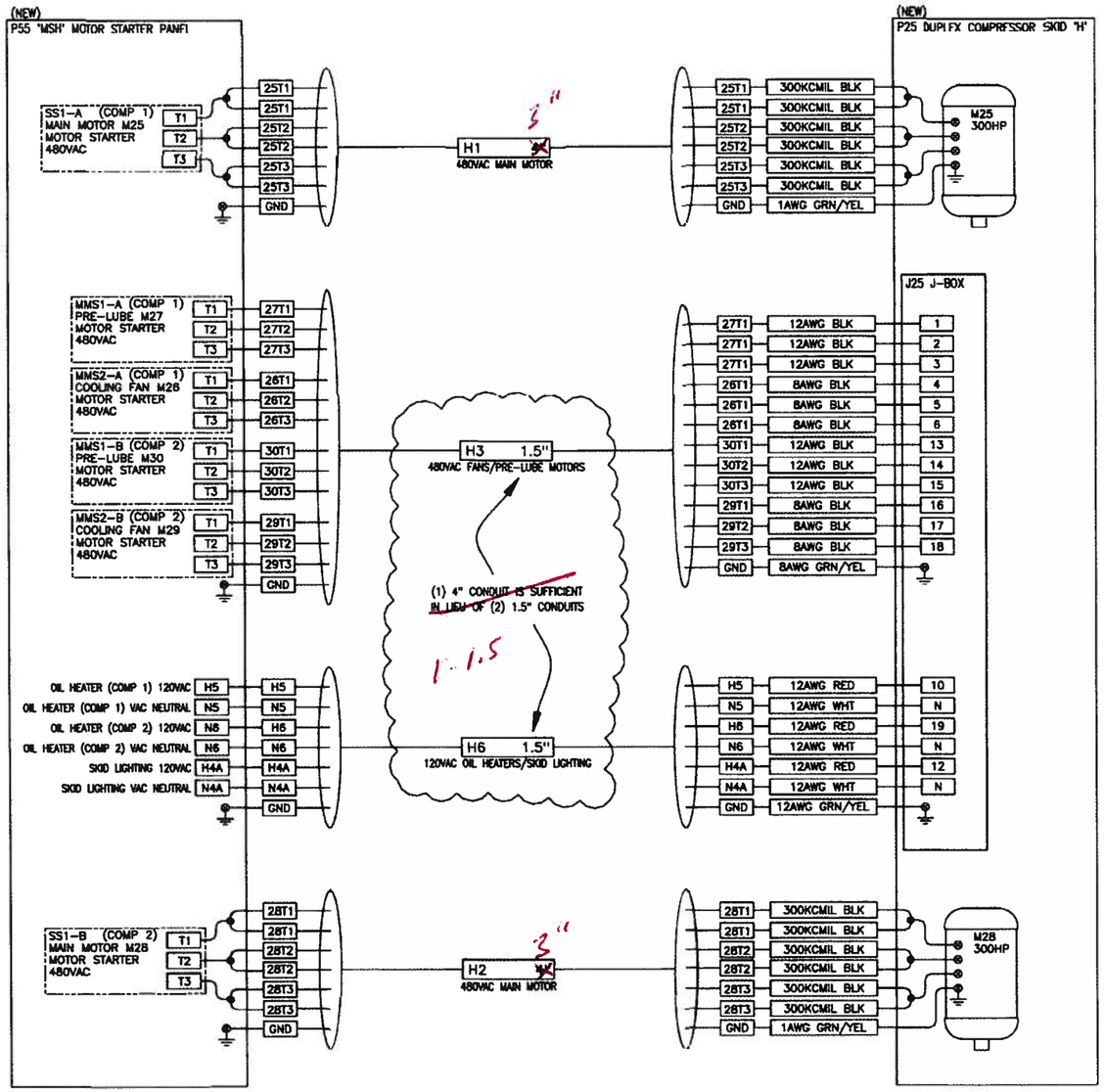
NEW DUPLEX COMPRESSOR SKID 'H' INTERCONNECT

PER RFI 61



NOTES:
- 120VAC POWER TO NEW DUPLEX COMPRESSOR SKID'H' (P25) TO BE SUPPLIED FROM EXISTING UPS PANEL
- ESD LOOP AND ETHERNET CONNECTION TO BE SUPPLIED FROM NEW MASTER CONTROL PANEL (P11)
- 120VAC OIL HEATER POWER AND COMPRESSOR SKID 'D' LIGHTING TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSH' (P55)
- 480VAC POWER TO COOLING FANS AND PRE-LUBE MOTORS TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSH' (P55)
- 480VAC POWER TO MAIN MOTORS (M25, M28) TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSH' (P55)
- ETHERNET CONNECTION TO NEW MOTOR STARTER PANEL 'MSH' (P55) TO BE SUPPLIED FROM NEW MASTER CONTROL PANEL (P11)





ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION
B	12/28/16 MWS	CUSTOMER MARKUPS
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES
H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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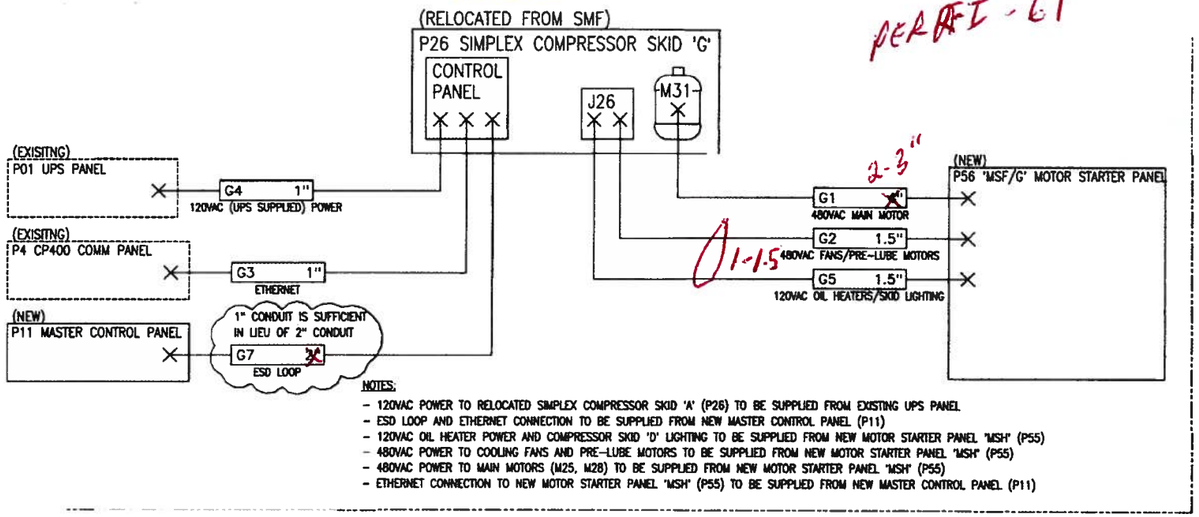
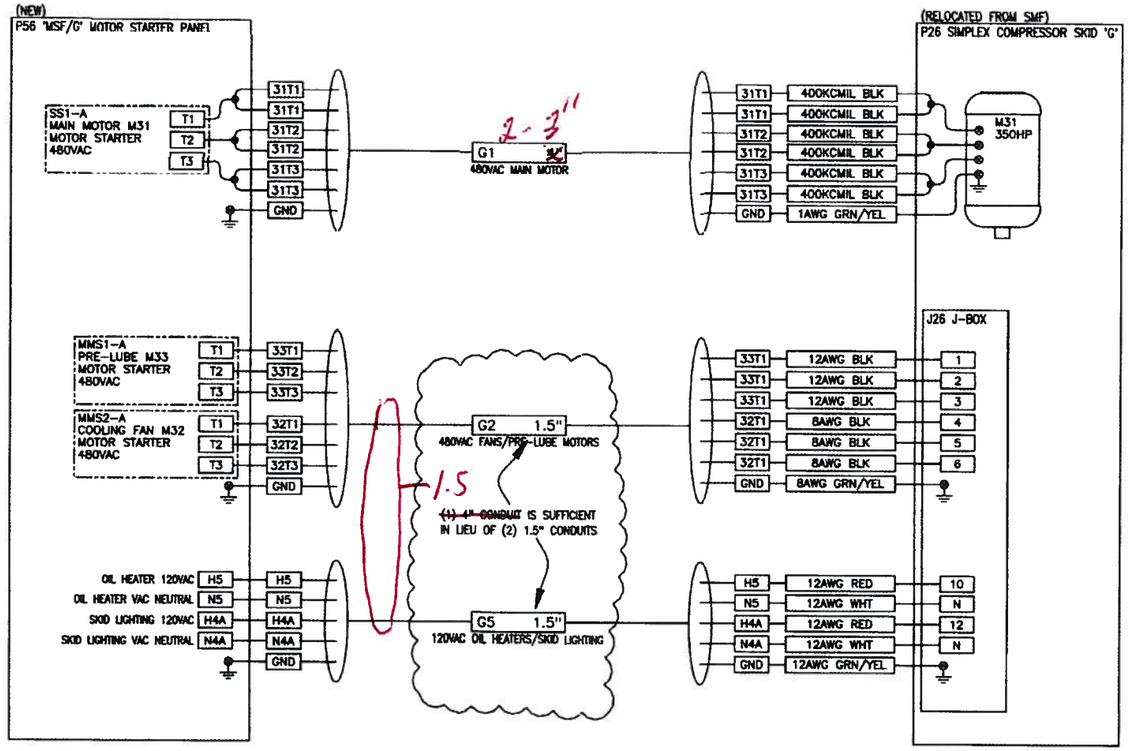
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
NEW DUPLEX SKID 'H'/MOTOR STARTER PANEL 'MSH' INTERCONNECT

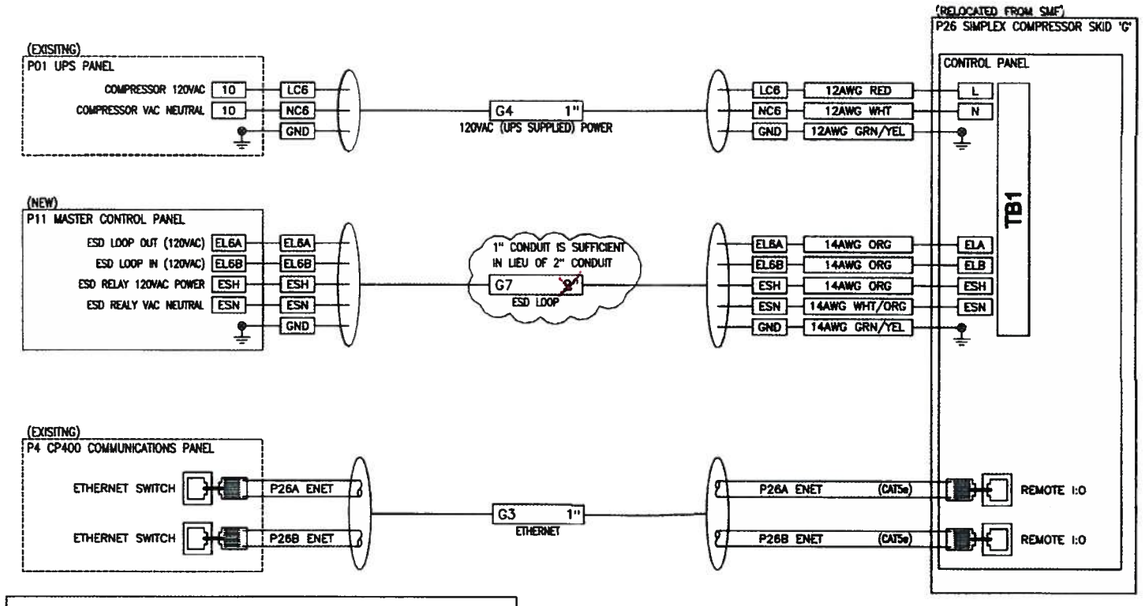
CUSTOMER	Trillium – RTC Las Vegas – IBMF	PROJECT NO.	50453		
DRN MWS	DATE 11/18/16	SCALE N/A	DRAWING NO. A80-50-50453	REV. J	
CHK –	DATE –	SHT 5	TOT 14		

RELOCATED SIMPLEX COMPRESSOR SKID 'G' INTERCONNECT



NOTES:
- 120VAC POWER TO RELOCATED SIMPLEX COMPRESSOR SKID 'A' (P26) TO BE SUPPLIED FROM EXISTING UPS PANEL
- ESD LOOP AND ETHERNET CONNECTION TO BE SUPPLIED FROM NEW MASTER CONTROL PANEL (P11)
- 120VAC OIL HEATER POWER AND COMPRESSOR SKID 'D' LIGHTING TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSF' (P55)
- 480VAC POWER TO COOLING FANS AND PRE-LUBE MOTORS TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSF' (P55)
- 480VAC POWER TO MAIN MOTORS (M25, M28) TO BE SUPPLIED FROM NEW MOTOR STARTER PANEL 'MSF' (P55)
- ETHERNET CONNECTION TO NEW MOTOR STARTER PANEL 'MSF' (P55) TO BE SUPPLIED FROM NEW MASTER CONTROL PANEL (P11)





ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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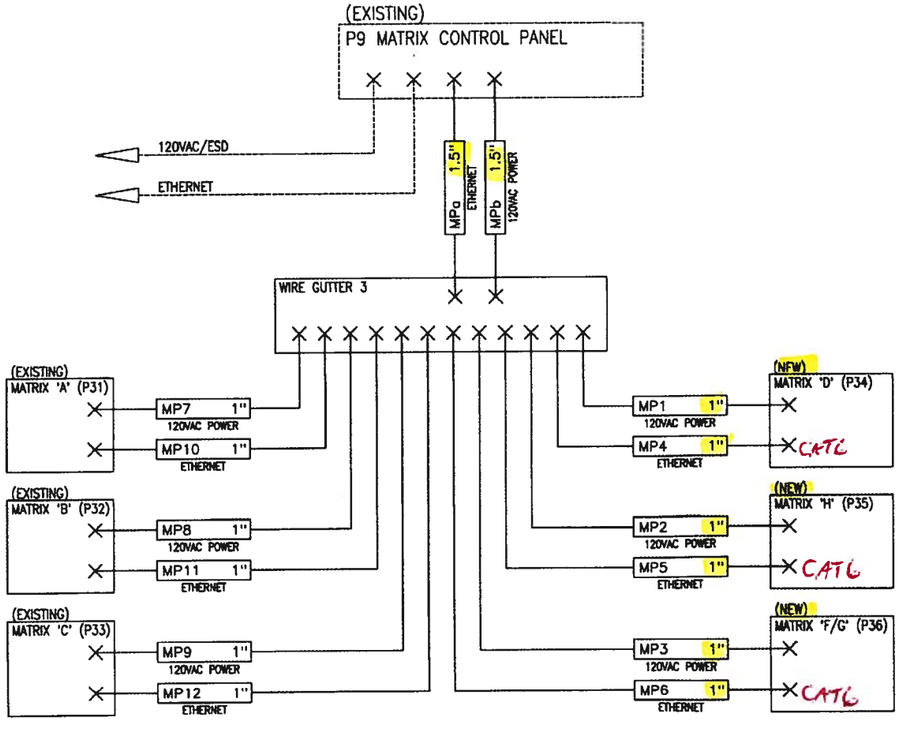
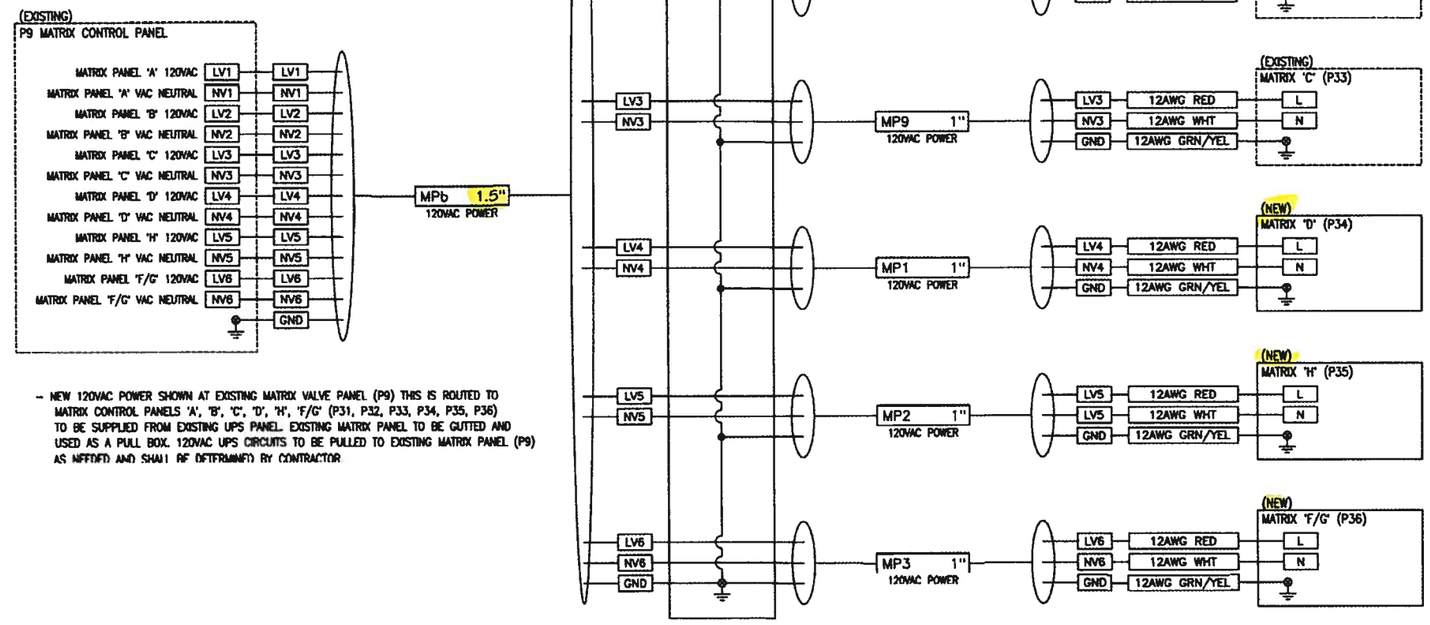
TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS NEW SIMPLEX SKID 'G'/MOTOR STARTER PANEL 'MSF/G' INTERCONNECT		
CUSTOMER	Trillium – RTC Las Vegas – IBMF	PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A	DRAWING NO. A80-50-50453 / REV. J
CHK –	DATE –	SHT 6 / TOT 14	



NOTES:

- EXISTING 120VAC POWER/ESD TO REMAIN AS IS
- CsCAN NETWORK TO BE REMOVED
- EXISTING MATRIX CONTROL PANELS 'A', 'B', 'C' (P31, P32, P33) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O
- NEW ETHERNET INTERFACE TO MATRIX CONTROL PANELS 'A', 'B', 'C', 'D', 'H', 'F/G' (P31, P32, P33, P34, P35, P36) REMOTE I:O FROM NEW MASTER CONTROL PANEL (P11) TO BE INSTALLED
- NEW 120VAC POWER TO BE ROUTED TO MATRIX CONTROL PANELS 'A', 'B', 'C', 'D', 'H', 'F/G' (P31, P32, P33, P34, P35, P36) TO BE SUPPLIED FROM EXISTING UPS PANEL
- EXISTING MATRIX CONTROL PANEL TO BE GUTTED AND USED AS A PULL BOX
- ESD STRING TO BE EXTENDED TO EXISTING AND NEW MATRIX PANELS 'A', 'B', 'C', 'D', 'H', 'F/G' (P31, P32, P33, P34, P35, P36)



- NEW 120VAC POWER SHOWN AT EXISTING MATRIX VALVE PANEL (P9) THIS IS ROUTED TO MATRIX CONTROL PANELS 'A', 'B', 'C', 'D', 'H', 'F/G' (P31, P32, P33, P34, P35, P36) TO BE SUPPLIED FROM EXISTING UPS PANEL. EXISTING MATRIX PANEL TO BE GUTTED AND USED AS A PULL BOX. 120VAC UPS CIRCUITS TO BE PULLED TO EXISTING MATRIX PANEL (P9) AS NEEDED AND SHALL BE DETERMINED BY CONTRACTOR

ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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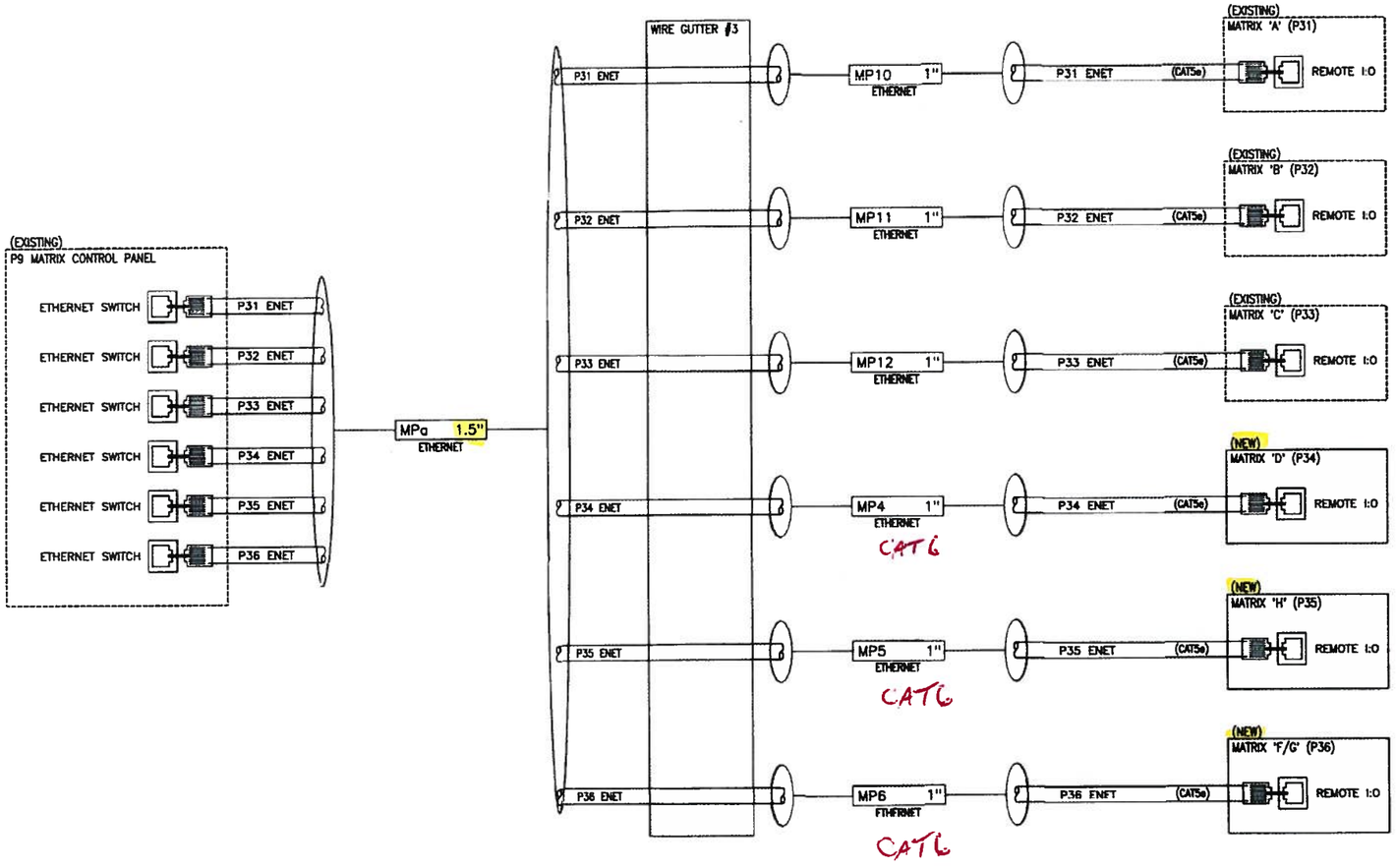
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
EXISTING MATRIX CONTROL PANEL UPGRADE/INTERCONNECT

CUSTOMER	Trillium – RTC Las Vegas – IBMF			PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A		DRAWING NO.	REV.
CHK –	DATE –	SHT 7	TOT 14	A80-50-50453	J



ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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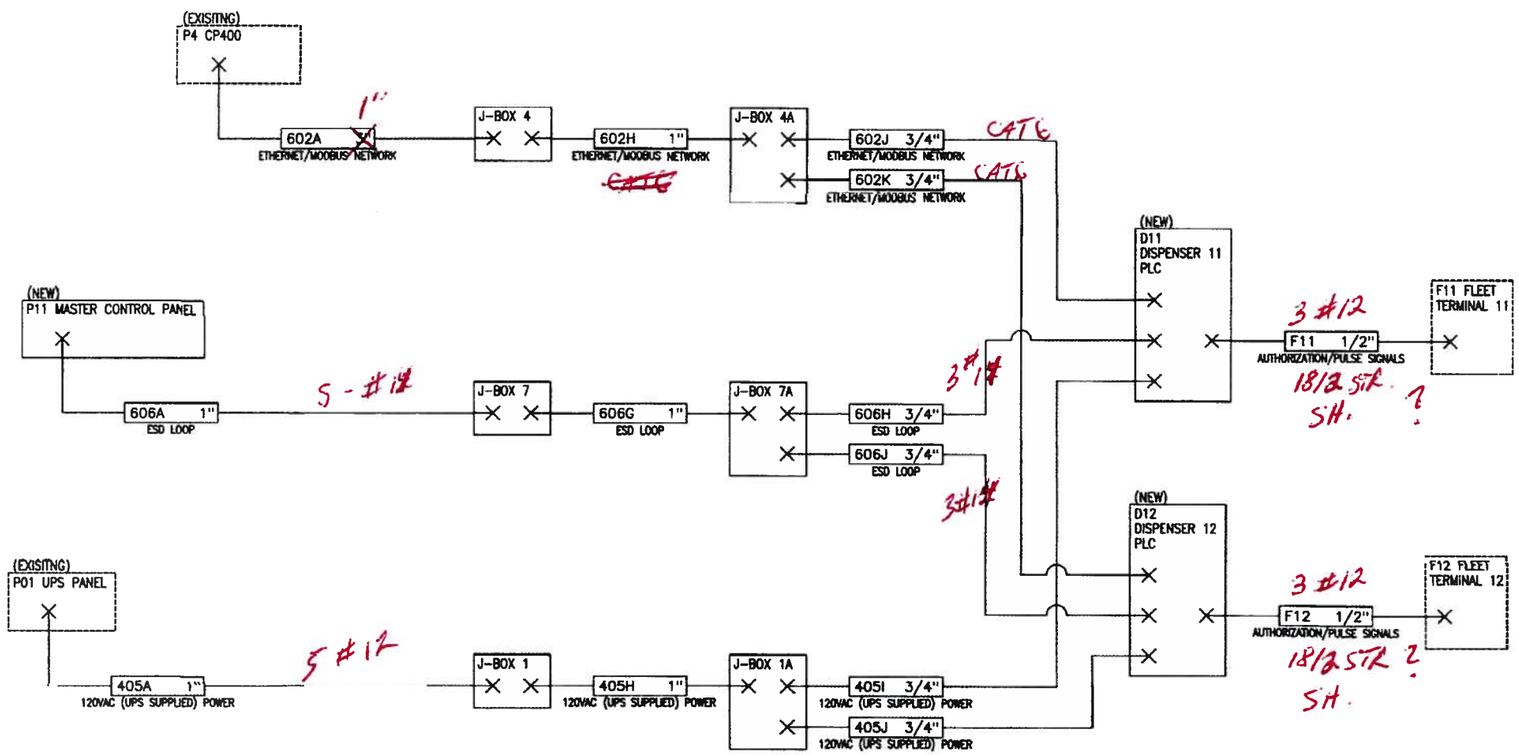
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
EXISTING MATRIX CONTROL PANEL UPGRADE/INTERCONNECT (CONTINUED)

CUSTOMER	Trillium – RTC Las Vegas – IBMF			PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A		DRAWING NO.	REV.
CHK –	DATE –	SHT 8	TOT 14	A80-50-50453	J

EXISTING FLEET DISPENSER CONTROL PANEL UPGRADE AND NEW PLC DISPENSER INTERCONNECT



NOTES:
- EXISTING FLEET DISPENSER CONTROL PANEL (P6) TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I:O
- CaCAN NETWORK TO FLEET DISEPNSER CONTROL PANEL (P6) TO BE REMOVED
- NEW ETHERNET INTERFACE TO FLEET DISPENSER CONTROL PANEL (P6) REMOTE I:O FROM NEW MASTER CONTROL PANEL (P11) TO BE INSTALLED
- NEW PLC DISPENSERS (D11, D12) TO BE INSTALLED AND INTEGRATED
- 120VAC POWER TO BE SUPPLIED TO NEW PLC DISPENSERS (D11, D12) FROM EXISTING UPS PANEL (P01)
- 120VAC HOSE ACTIVE SIGNALS BETWEEN NEW PLC DISPENSERS (D11, D12) AND EXISTING FLEET DISPENSER CONTROL PANEL (P6) TO BE INSTALLED
- MODBUS NETWORK TO BE EXTENDED TO NEW PLC DISPENSERS (D11, D12)

DISPENSER DESIGN ALLOWS FOR A MAXIMUM OF (3) 3/4" AND (1) 1/2" CONDUITS

ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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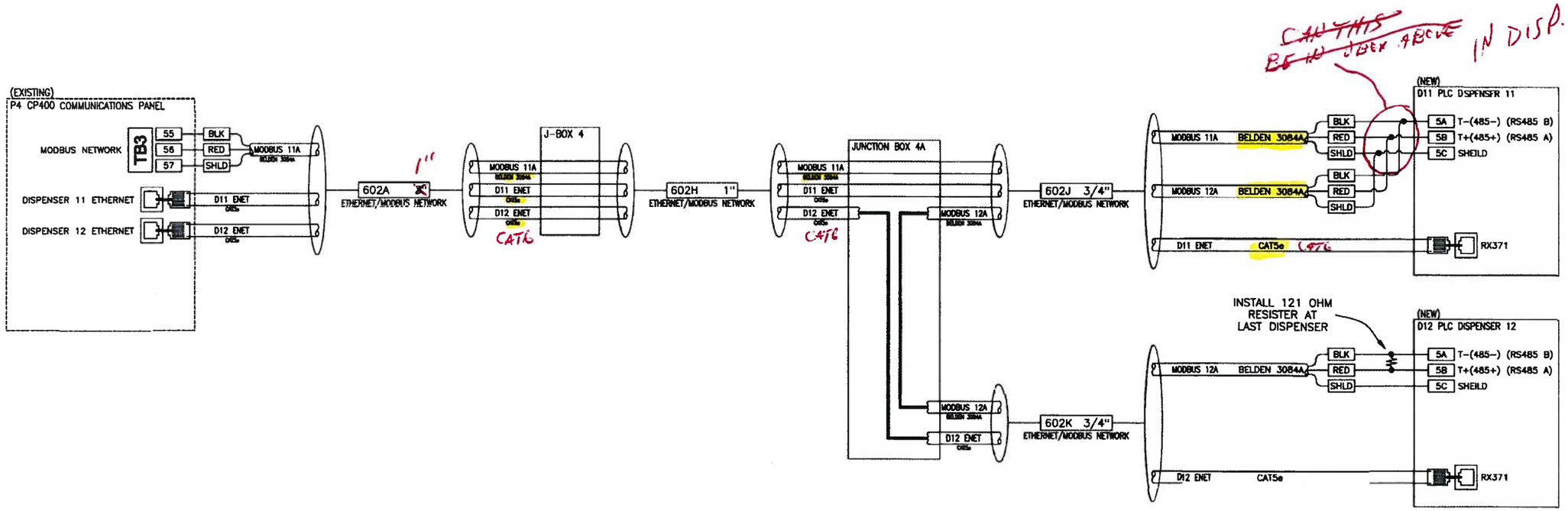
TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS EXISTING FLEET CONTROL PANEL/NEW PLC DISPENSER INTERCONNET		
CUSTOMER	Trillium – RTC Las Vegas – IBMF	PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A	DRAWING NO. A80-50-50453
CHK –	DATE –	SHT 9 TOT 14	REV. J

NEW PLC DISPENSER ETHERNET/MODBUS NETWORK



ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION
B	12/28/16 MWS	CUSTOMER MARKUPS
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES

REV	DATE/BY	DESCRIPTION
H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

ALL ELECTRICAL CONNECTIONS MUST BE COMPLETED OR SUPERVISED BY QUALIFIED PERSONNEL, AND MEET ALL LOCAL AND APPLICABLE CODES. REFER TO NEC FOR MORE INFORMATION.

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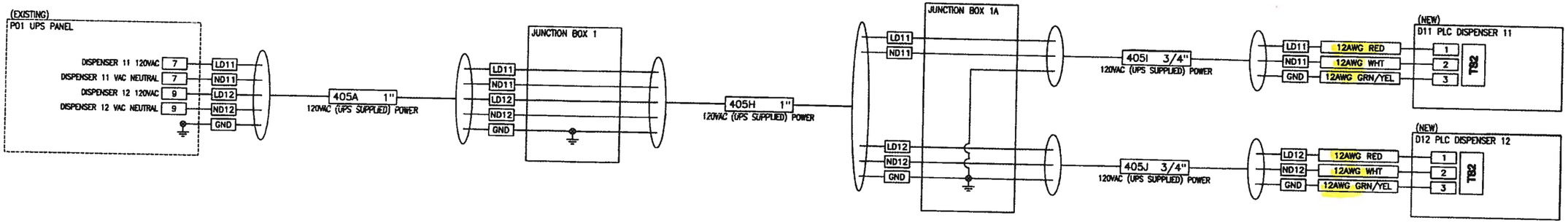
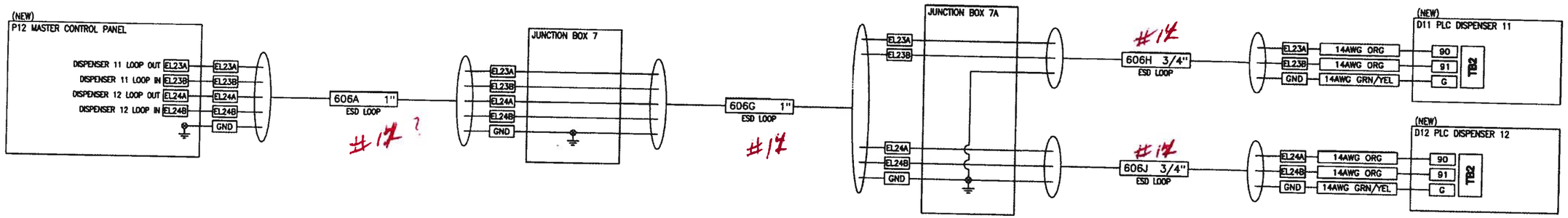
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
NEW PLC DISPENSERS 11, 12 MODBUS AND ETHERNET INTERCONNECT

CUSTOMER	Trillium – RTC Las Vegas – IBMF			PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A		DRAWING NO.	REV.
CHK –	DATE –	SHT 10	TOT 14	A80-50-50453	J

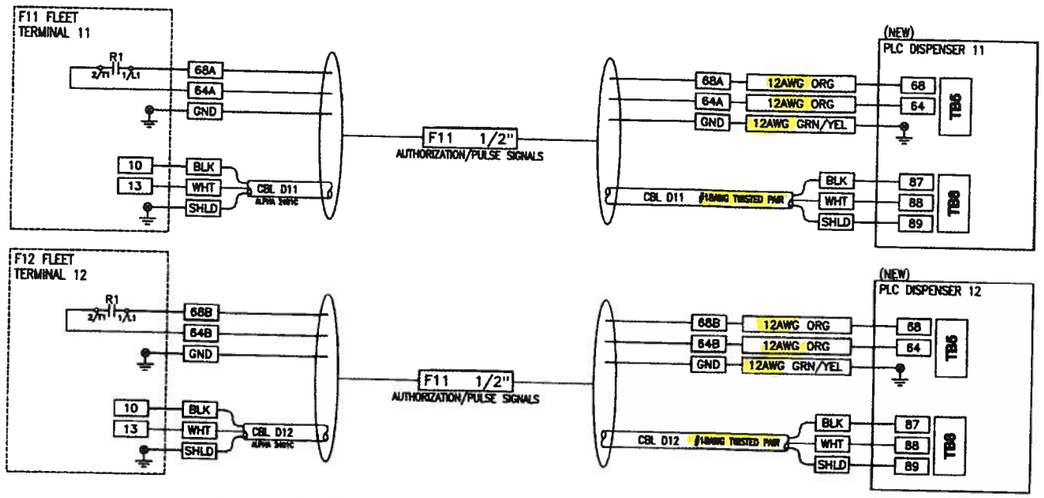
NEW PLC DISPENSER POWER



NEW PLC DISPENSER ESD INTERCONNECT



NEW PLC DISPENSER FUEL MANAGEMENT



ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION
B	12/28/16 MWS	CUSTOMER MARKUPS
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES
H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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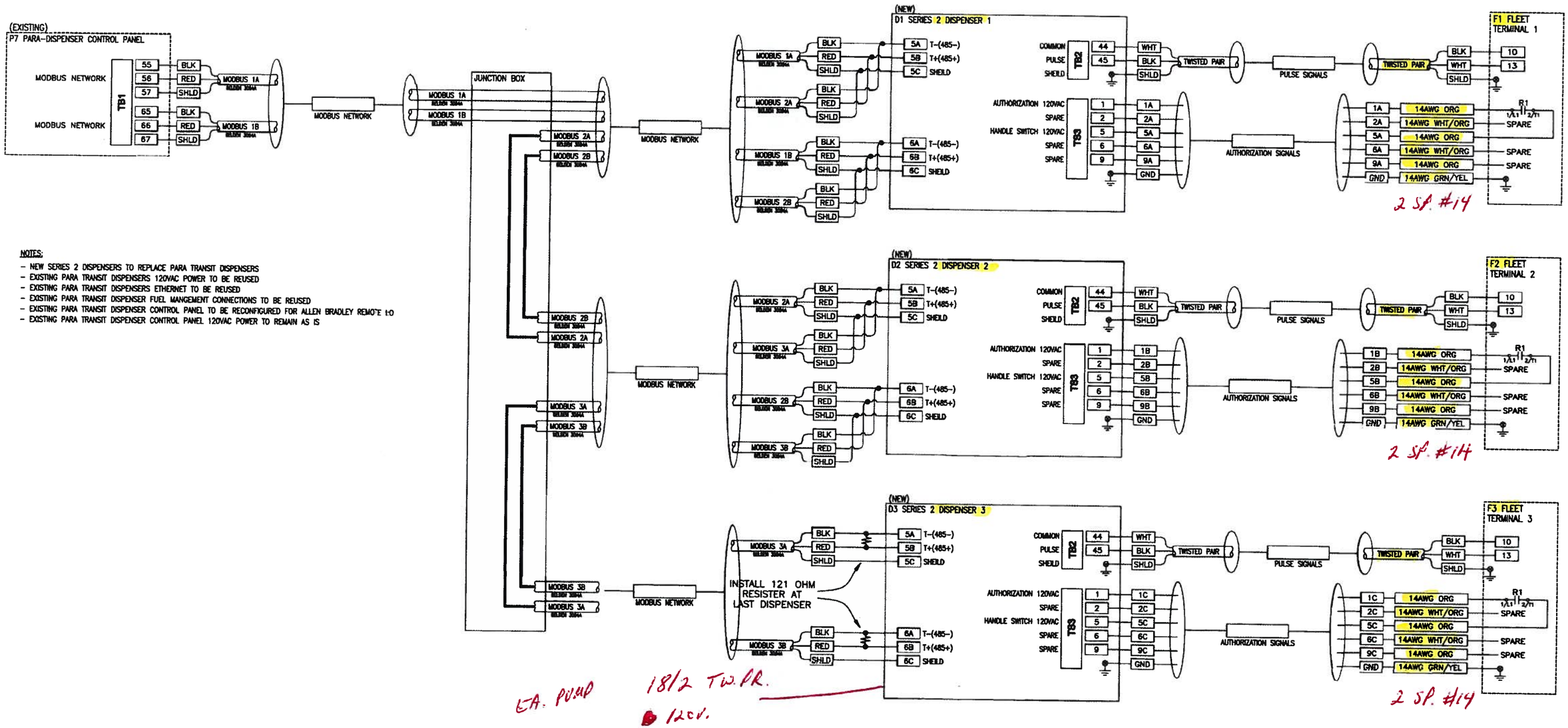
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
NEW PLC DISPENSERS 11, 12 POWER/ESD/FUEL MANAGEMENT INTERCONNECT

CUSTOMER	Trillium – RTC Las Vegas – IBMF			PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A		DRAWING NO.	REV.
CHK –	DATE –	SHT 11	TOT 14	A80-50-50453	J

NEW SERIES 2 DISPENSER MODBUS NETWORK / FUEL MANAGEMENT INTERCONNECT



NOTES:

- NEW SERIES 2 DISPENSERS TO REPLACE PARA TRANSIT DISPENSERS
- EXISTING PARA TRANSIT DISPENSERS 120VAC POWER TO BE REUSED
- EXISTING PARA TRANSIT DISPENSERS ETHERNET TO BE REUSED
- EXISTING PARA TRANSIT DISPENSER FUEL MANGEMENT CONNECTIONS TO BE REUSED
- EXISTING PARA TRANSIT DISPENSER CONTROL PANEL TO BE RECONFIGURED FOR ALLEN BRADLEY REMOTE I/O
- EXISTING PARA TRANSIT DISPENSER CONTROL PANEL 120VAC POWER TO REMAIN AS IS

ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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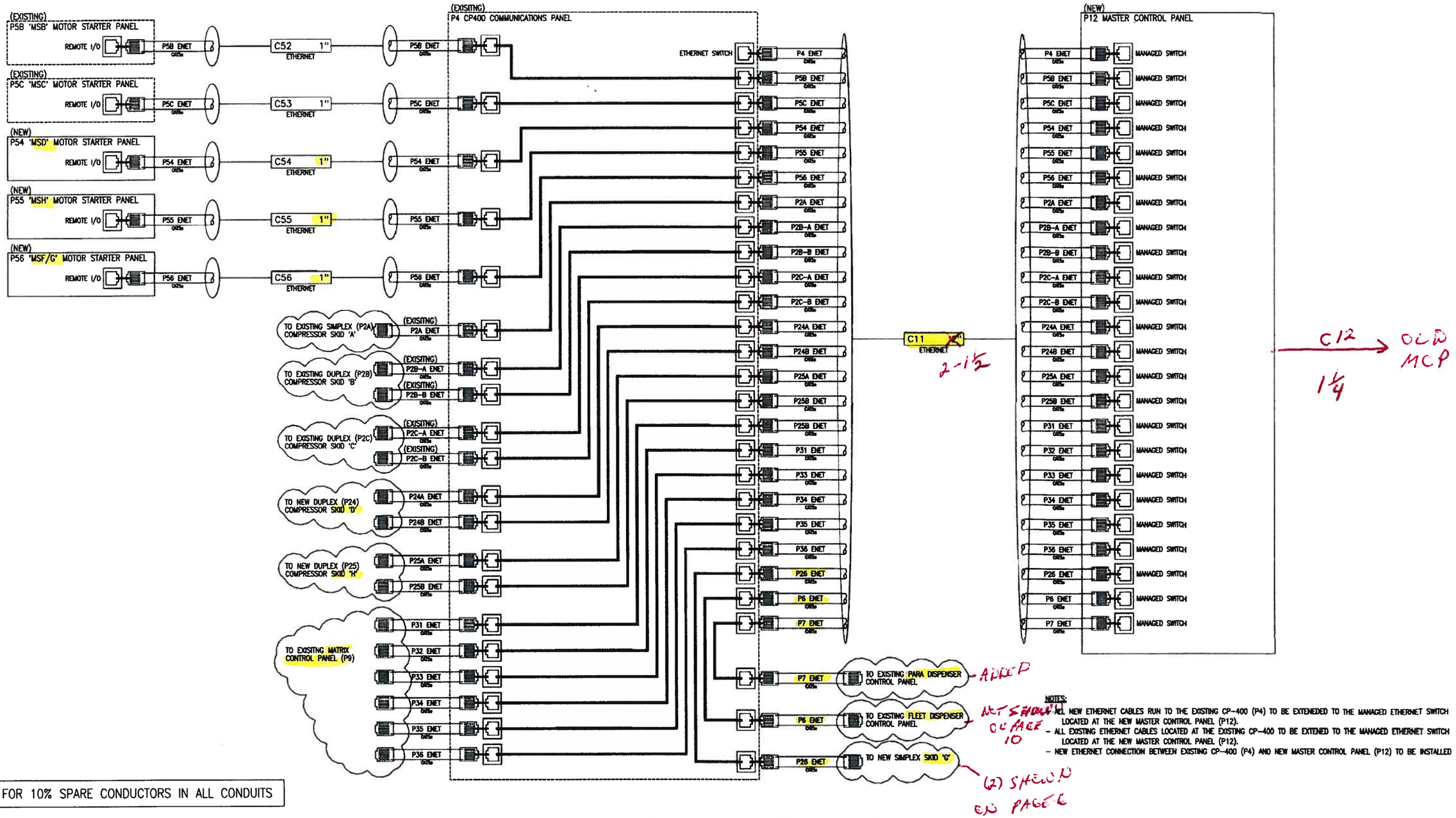
TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
NEW SERIES 2 DISPENSER MODBUS NETWORK/FUEL MANAGEMENT INTERCONNECT

CUSTOMER	Trillium – RTC Las Vegas – IBMF			PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A		DRAWING NO.	REV.
CHK –	DATE –	SHT 12	TOT 14	A80-50-50453	J

SITE ETHERNET INTERCONNECTION



NOTES:
1. ALL NEW ETHERNET CABLES RUN TO THE EXISTING CP-400 (P4) TO BE EXTENEDED TO THE MANAGED ETHERNET SWITCH LOCATED AT THE NEW MASTER CONTROL PANEL (P12).
- ALL EXISTING ETHERNET CABLES LOCATED AT THE EXISTING CP-400 TO BE EXTENED TO THE MANAGED ETHERNET SWITCH LOCATED AT THE NEW MASTER CONTROL PANEL (P12).
- NEW ETHERNET CONNECTION BETWEEN EXISTING CP-400 (P4) AND NEW MASTER CONTROL PANEL (P12) TO BE INSTALLED

ALLOW FOR 10% SPARE CONDUCTORS IN ALL CONDUITS

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO	H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION	G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
B	12/28/16 MWS	CUSTOMER MARKUPS	F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES	E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

ALL ELECTRICAL CONNECTIONS MUST BE COMPLETED OR SUPERVISED BY QUALIFIED PERSONNEL, AND MEET ALL LOCAL AND APPLICABLE CODES. REFER TO NEC FOR MORE INFORMATION.

ANGI ENERGY SYSTEMS
305 W DELAVAN DR
JANESVILLE, WI 53546
PH: 608-563-2800
www.angienergy.com

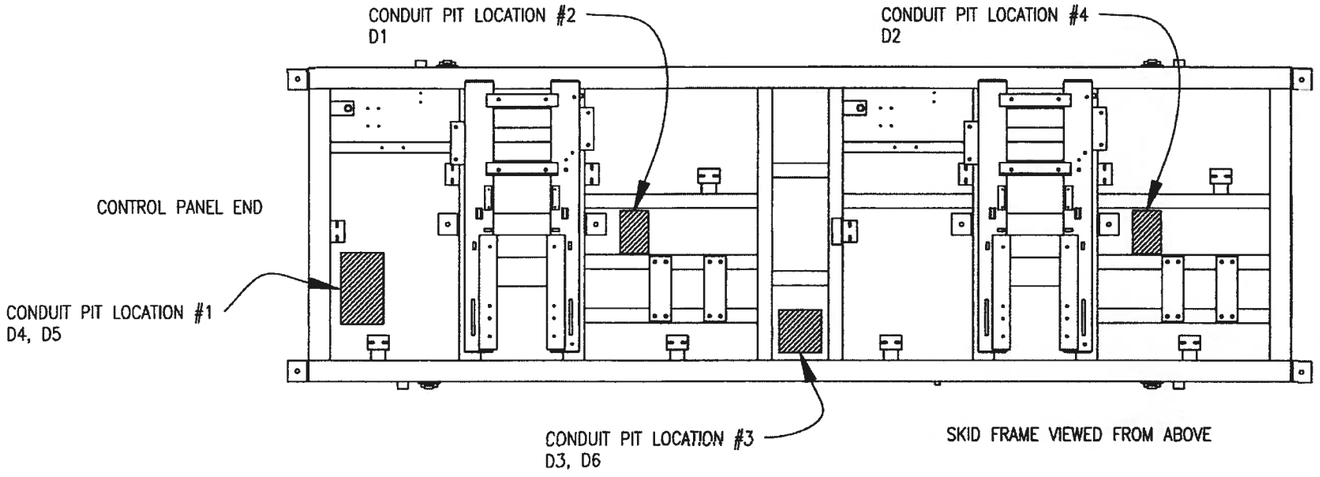
CONTROLLED DRAWING
THIS DRAWING COMPLIES WITH AGENCY LISTINGS. DO NOT CHANGE WITHOUT APPROVAL FROM ENGINEERING DEPARTMENT.

TITLE: CONDUIT/CUSTOMER INTERCONNECT DETAILS
SITE ETHERNET INTERCONNECTION

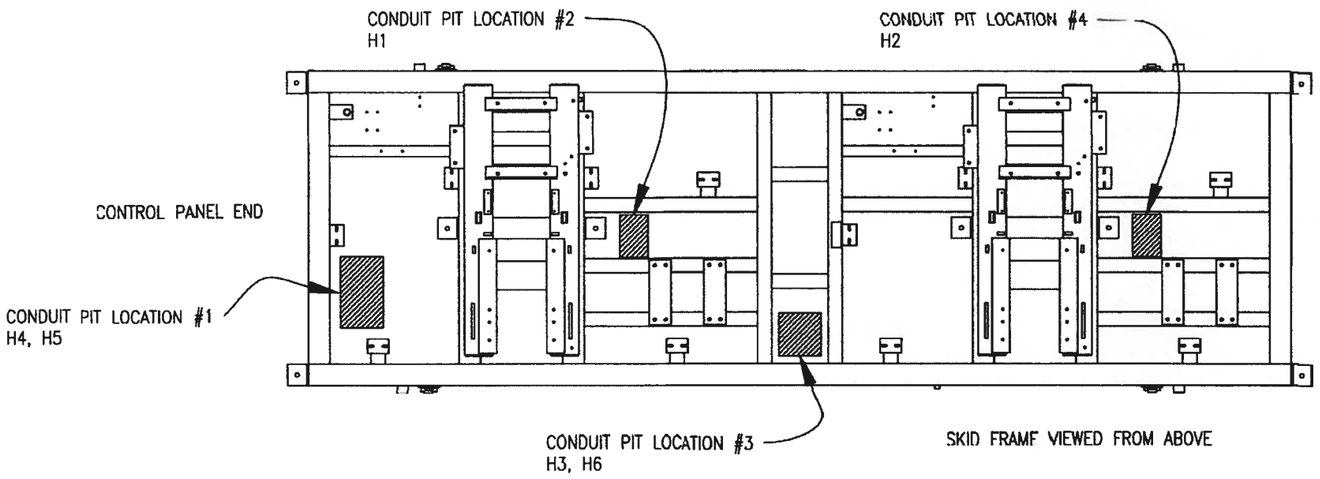
CUSTOMER	Trillium – RTC Las Vegas – IBMF	PROJECT NO.	50453			
DRN MWS	DATE 11/18/16	SCALE	N/A	DRAWING NO.		REV.
CHK –	DATE –	SHT 13	TOT 14		A80-50-50453	J

NEW COMPRESSOR DUPLEX SKID 'D' (P24)

FOR PIT LOCATION DIMENSTIONS, REFER TO DWG# A05-10-ED-PIT-NO_ENC_3



NEW COMPRESSOR DUPLEX SKID 'H' (P25)



REV	DATE/BY	DESCRIPTION
D	1/20/17 MWS	ECN# CN04474 ADDED PLC TRANSIT DISPENSER INFO
C	1/11/17 MWS	(CR) MAIN MOTOR/PRE-LUBE CONDUCTOR SIZES MATRIX PANELS INTERCONNECTION
B	12/28/16 MWS	CUSTOMER MARKUPS
J	4/5/17 MWS	REVISED AS PER CUSTOMER REDLINES

REV	DATE/BY	DESCRIPTION
H	3/29/17 MWS	REVISED AS PER CUSTOMER REDLINES
G	2/1/17 MWS	ECN# CN04516 CHANGES PER CUSTOMER REVIEW
F	1/31/17 MWS	ECN# CN04510 CHANGES PER CUSTOMER REVIEW
E	1/30/17 MWS	ECN# CN04507 CHANGES PER CUSTOMER REVIEW

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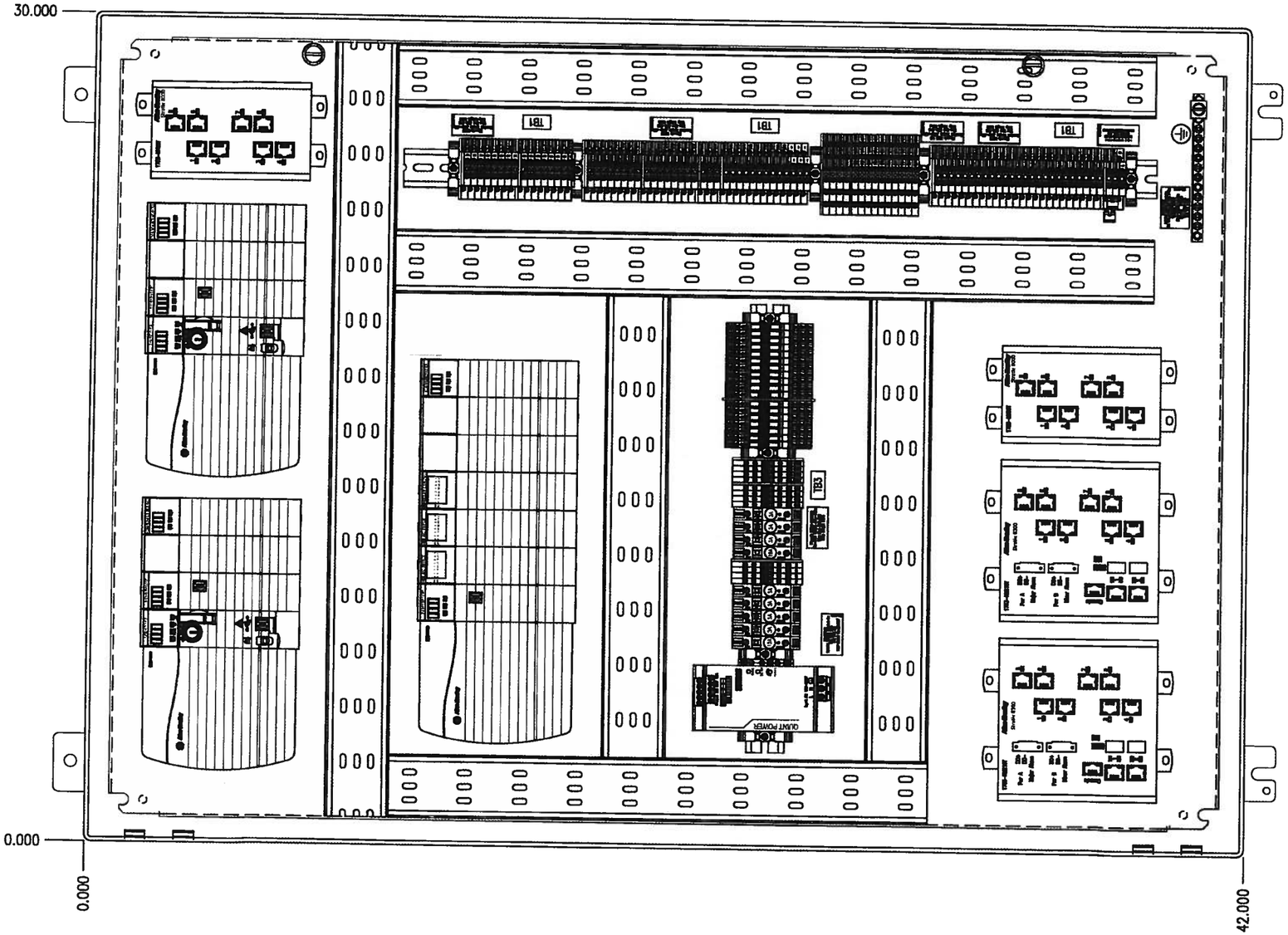
TITLE	CONDUIT/CUSTOMER INTERCONNECT DETAILS NEW COMPRESSOR PIT LOCATIONS/CONDUIT CALL OUT		
CUSTOMER	Trillium – RTC Las Vegas – IBMF	PROJECT NO.	50453
DRN MWS	DATE 11/18/16	SCALE N/A	DRAWING NO. A80-50-50453
CHK –	DATE –	SHT 14 TOT 14	REV. J



REV	DATE/BY	DESCRIPTION
B	2/21/17 MWS	CHANGES TO CONDUIT CALL OUTS BASED ON CUSTOMER REQUIREMENTS
A	2/15/17 MWS	DEDICATED PENETRATIONS FOR USE

REV	DATE/BY	DESCRIPTION

ALL ELECTRICAL CONNECTIONS MUST BE COMPLETED OR SUPERVISED BY QUALIFIED PERSONNEL, AND MEET ALL LOCAL AND APPLICABLE CODES. REFER TO NEC FOR MORE INFORMATION.

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CONTROLLED DRAWING
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TITLE	MASTER CONTROL PANEL – AB CONTROL LOGIX ENCLOSURE DIMENSIONS, BACK PANEL LAYOUT
CUSTOMER	Trillium – RTC Las Vegas – SMF/IBMF
PROJECT NO.	50452/50453
DRN MWS	DATE 2/2/17
SCALE	
CHK	DATE
SHT 1	TOT 3
DRAWING NO.	E05-20-02-03
REV.	B

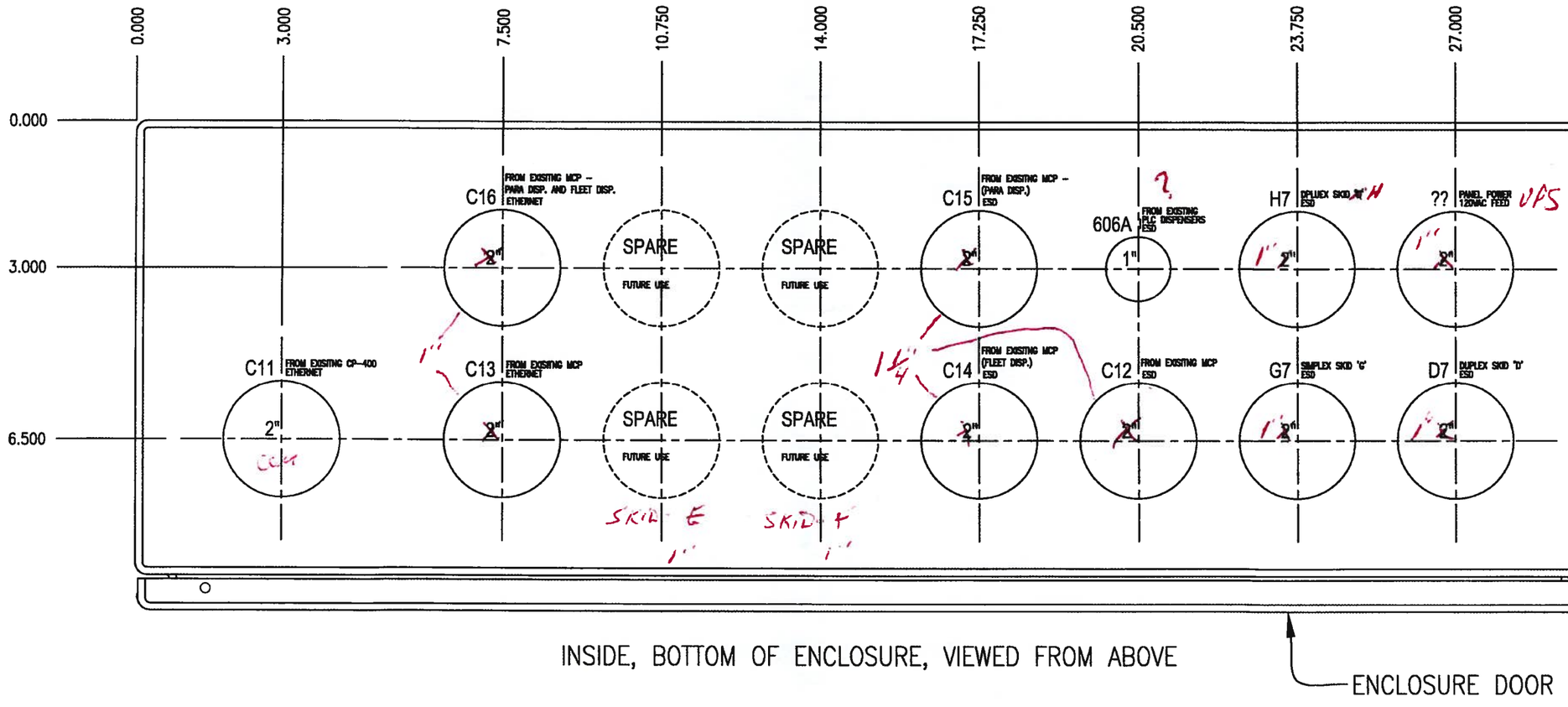
AUTOCAD WINDCHILL

2/1/17

TRILLIUM

INSIDE, BOTTOM OF ENCLOSURE, VIEWED FROM ABOVE

50453 IBMF SITE, MASTER CONTROL PANEL CONDUIT PENETRATION DETAILS



INSIDE, BOTTOM OF ENCLOSURE, VIEWED FROM ABOVE

REV	DATE/BY	DESCRIPTION	REV	DATE/BY	DESCRIPTION
B	2/21/17 MWS	CHANGES TO CONDUIT CALL OUTS BASED ON CUSTOMER REQUIREMENTS			
A	2/15/17 MWS	DEDICATED PENETRATIONS FOR USE			

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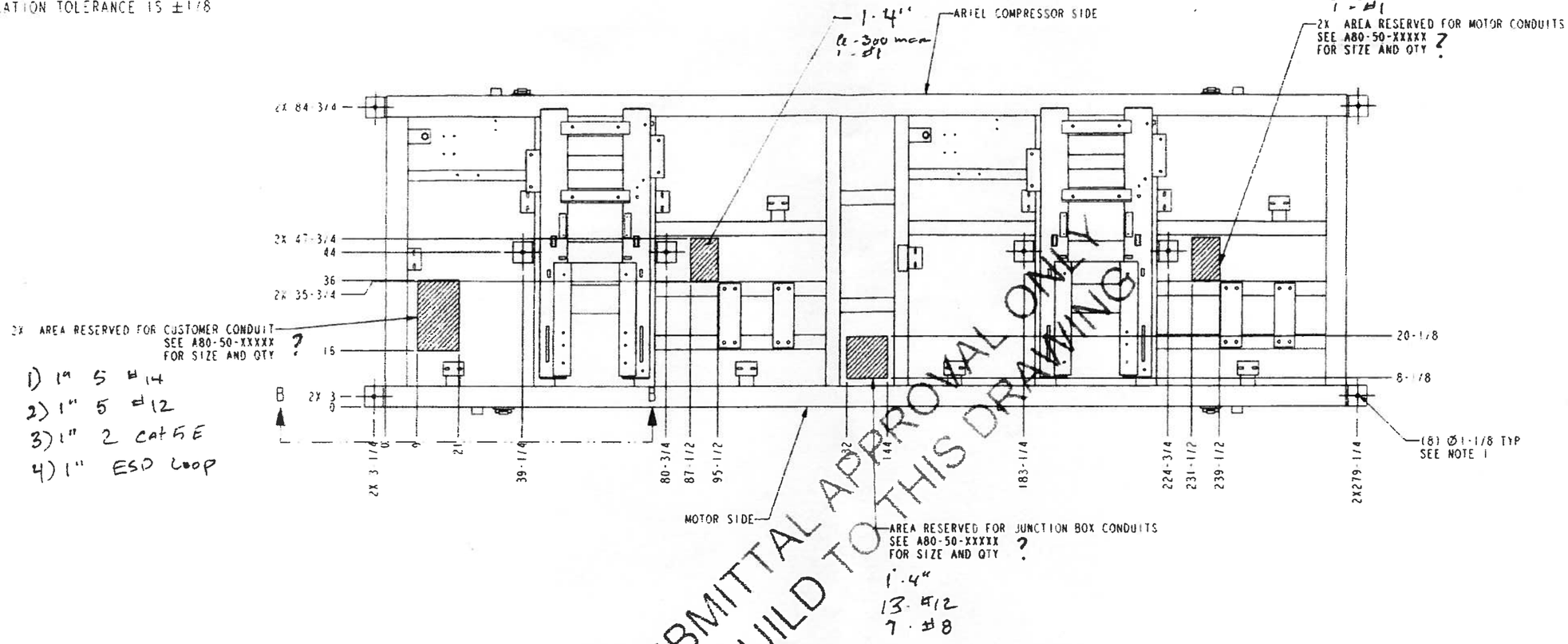
TITLE	MASTER CONTROL PANEL – AB CONTROL LOGIX IBMF MASTER ENCLOSURE CONDUIT LAYOUT
CUSTOMER	Trillium – RTC Las Vegas – SMF/IBMF
PROJECT NO.	50452/50453
DRN MWS	DATE 2/2/17
CHK	DATE
SCALE	
SHT 2	TOT 3
DRAWING NO.	E05-20-02-03
REV.	B

AUTOCAD WINDCHILL

NOTE
1 THE ANCHOR BOLT IS Ø1.0
2 LOCATION TOLERANCE IS ±1/8



1) 1" 5 #14
2) 1" 5 #12
3) 1" 2 cat5E
4) 1" ESD Loop

FOR SUBMITTAL APPROVAL ONLY
DO NOT BUILD TO THIS DRAWING

ANCHOR BOLT LOCATIONS
AND CONDUIT PIT PENETRAION LOCATIONS
(SEE"A05-10-ED-SIDE-NO_ENC" FOR SIDE PENETRATIONS)

REVIEWED BY
THE WHITING-TURNER CONTRACTING COMPANY
SUBMITTAL Duplex Compressor P&ID and Shops
430105-34-1
DATE 11/22/2016 BY Daniel Miller

ANGI

TITLE	GENERAL LAYOUT MG300E DUPLEX-NO ENCLOSURE
CUSTOMER	PROJECT NO
SHEET 3 of 3	SCALE 0.063
DRAWN BY JLO	DATE 10/13/2015
DRAWING NO	A05 10-ED-PIT NO_ENC
REV	B

RELEASED

REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA

PROJECT SPECIFICATIONS

FOR

CNG FUELING UPGRADES – PHASE B

ISSUED FOR BID
03-18-2020

Integrated Bus Maintenance Facilities (IBMF)
3180 Citizen Avenue, North Las Vegas NV 89032
APN 139-17-301-020

Sunset Maintenance Facility (SMF)
5165 W. Sunset Road, Las Vegas NV 89119
APN 176-01-502-029

RTC CNG Facilities Upgrades Phase B
Project Specifications Table of Contents

260511	Requirements for Electrical Installations
260519	Low-Voltage Electrical Power Conductors And Cables
260526	Grounding and Bonding For Electrical Systems
260533	Raceway and Boxes For Electrical Systems
260541	Underground Electrical Construction
260800	Commissioning of Elect Systems
262200	Low-Voltage Transformers
262416	Panelboards
262726	Wiring Devices
263623	Automatic Transfer Switches
264100	Facility Lightning Protection
265600	Exterior Lighting

DIVISION 28 ELECTRONIC SAFETY AND SECURITY

280500	General Requirements
280513	Conductors and Cables
280514	Fiber Optics
280528	Raceways and Boxes
281300	Access Control System
281500	Electronic Components
282300	Video Surveillance
283111	Digital, Addressable Fire-Alarm System

DIVISION 31 EARTHWORK

311000	Site Clearing
312000	Earth Moving

DIVISION 32 EXTERIOR IMPROVEMENTS

321216	Asphalt Paving
323100	Electric Gate Operators
323119	Decorative Metal Security Fences and Gates

DIVISION 43 PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

430105	CNG Fueling Equipment & System

SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Use of premises.
5. Owner's Occupancy Requirements.
6. Work restrictions.
7. Parts and Labor Warranty
8. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification/location: CNG Upgrades at the Sunset Maintenance Facility, Clark County – 5165 West Sunset Road, Las Vegas, Nevada, 89118 and at the Integrated Bus Maintenance Facility, City of North Las Vegas NV – 3214 Citizens Avenue (cross street – Simmons Avenue) North Las Vegas, NV 89032.

B. Owner: The Regional Transportation Commission, 600 S. Grand Central Parkway, Suite 350, Las Vegas, NV 89106-4512.

C. Engineer; Fuel Solutions, 5755 Uplander Way, Suite A, Culver City, CA 90230.

D. Owner: Regional Transportation Commission, 600 S. Grand Central Parkway, Las Vegas NV 89106-4512.

E. The scope of this project is to provide Compressed Natural Gas (CNG) upgrades to the Integrated Bus Maintenance Facility (IBMF) and Sunset Maintenance Facility (SMF) sites. These upgrades are required to meet the RTC's CNG fueling needs for the conversion of the fleet to CNG fuel. The work/requirements shall include but not be limited to, new dispensing equipment, new compression equipment, new/updated programming, testing and transition of all new/existing CNG equipment, reorientation of the fueling areas at both locations, piping, welding, concrete forming and placement and

all required appurtenances to provide CNG fueling support, all labor overtime, extra time, shutdowns and off peak hours.

F. The work at the Sunset Maintenance Facility (SMF) 5165 West Sunset Road, Clark County shall take precedence over the work at the Integrated Bus Maintenance Facility, 3120 Citizens Road, North Las Vegas and additional fueling shall be provided to this site prior to the removal and relocation of the existing CNG Skid to the IBMF site.

G. Staging areas at each site have been identified and included in the bid documents.

H. The normal weekly work hours shall be from 7 AM to 5 PM daily, weekend and off hours work must be scheduled atleast 72 hours in advance and the Contractor shall include all shutdowns, off hours/premium time in the schedule of values.

I. The general conditions do not allow for overtime/premium time and all prospective bidders shall factor these requirements into the bids and schedule of values.

J. The contractor shall include in the project schedule, schedule of values, off hours/after-hours work to perform CNG system testing, commissioning and all related CNG performance testing. These work hours shall be from 10 PM to 5 AM during the workweek or as requested by the Contractor.

K. The Sunset Maintenance Facility SW Gas MSA is to be removed and replaced during the initial phases of construction and this work will create a shutdown that will require the GC and his subcontractors to perform weekend work. This weekend work will require the GC to install gas piping from the end of the SW Gas MSA to the on-site RTC CNG dryer inlet. This work shall be identified in the GC's schedule, the GC's schedule of values and all related costs shall be identified in the schedule of values.

L. The work on this SW Gas MSA will be closely coordinated with the installation of the required CMU wall at this location. All footings and excavations at this location shall be potholed and depths/locations identified to assure the new CMU wall does not conflict with the existing field conditions.

M. The GC shall closely coordinate with the RTC's CNG Maintenance Contractor (Trillium) and shall assure all existing CNG field conditions, new equipment installations and programming of all equipment are identified and factored into each project schedule.

N. The GC shall coordinate with Pac van and provide a new Mobile Mini to be installed at the SMF site. The purchase and delivery, installation and work related to this equipment shall be included in the schedule of values.

O. The GC shall assure that all shutdowns, hot work welding-work restrictions and all work related restrictions are clearly identified as part of the bid package to all subcontractors and shall provide this information to all bidding subcontractors. The GC shall be responsible for all costs, delays and compensation regarding overtime, extra time, shutdowns, work restrictions, and all related restrictions and shall have no claim for compensation for these charges.

P. The Contractor will be responsible to perform subsurface footing/conflict/utility exploration and will develop a Utility Designation Plan, which includes Existing

Footings/Conduit Conflict Schedule and submit for the Owner's review. The costs of this work is identified as part of a Bid Allowance.

Q. The Contactor shall identify any/all UG conflicts and shall be responsible for any such issues that appear during construction. The Contractor shall also perform all required detailed site surveys including topographical surveys of the existing footing, curb and all elevations as identified in the design documents to assist in the completion of the proposed area concrete installation, drainage and shall perform all surveys that assist in the design process. Contractor shall be responsible for any/all missing, omitted information that leads to construction field issues, changes or requests for compensation. The Contractor shall have no claim for compensation regarding results attributed to unforeseen/existing conditions, new installations, surveys and survey results.

R. The GC shall be responsible for any/all damage caused/created by the GC's subcontractors and own personnel. The GC shall have no claim for compensation regarding any damage created/caused, the GC shall assure that all needed and necessary precautions are undertaken and any damage caused/created shall be fixed/corrected at no cost to the Owner and the GC shall make no claim for compensation, change order or any form of compensation.

S. The Contractor shall assure that all contracts with subcontractors/suppliers/etc. shall comply with the base contract requirements and the Contractor or his subcontractors shall have no claim for reimbursement for base contract requirements that could be missing or omitted in the subcontractors contracts. In addition, the Contractor or subcontractors shall not be entitled to compensation for any errors and omissions between the base contract requirements and subcontractor contracts, e.g. GC includes base contract work in their schedule of values and should subcontractors omit this work – they shall not be compensated via contingency, change orders, etc.

T. The Contractor shall submit a written construction plan to the RTC that will be used for the basis of his construction activities. The GC shall identify/address proposed construction phasing, staging, and field office needs; parking requirements during construction; construction equipment storage. Use of public roadways; protection of properties; dirt/debris mitigation; soil and environmental conditions; known hazardous material remediation; storm water drainage management; temporary facilities; traffic management; noise and vibration control; work hours, including, number of shifts and weekends. Temporary road closures, crane installation/usage or detours; emergency vehicle provisions; maintenance of access to all properties; public and worker safety protections; and maintenance of construction work zones.

U. This plan shall also address all shutdowns, all hot work, all overtime, weekend, partial shift and related construction work.

V. The GC is responsible for all coordination activities and shall include costs in the schedule of values for all coordination, including coordination with SW Gas, NV Energy and all entities having jurisdiction. These costs shall include and not be limited to CNG equipment removals, CNG equipment relocations, structural steel installation, and equipment/piping installation. As well as cmu wall/steel fence installations/footing/excavations, equipment installations/removals, trucking, rigging, cranes, shutdowns, overtime, extra time, weekend work, all field installations and

concrete removals/placement. The failure to properly coordinate these elements does not relieve the GC or his subcontractors of their contractual responsibility and no party shall be compensated for the failure to coordinate all contract work.

W. The GC shall assure that all bid items are included in each bid received and shall be responsible for bids that are missing base bid/contract work.

X. The GC shall be responsible for all cranes, rigging and related installations and shall have no claim for compensation for any related work regarding the removal of/reinstallation at the IBMF site, of the existing SMF CNG compressor skid, all installations that will take place within/under the existing canopy roofs and all related installations and removals.

Y. The GC shall assure all installations are properly coordinated and that any interferences encountered are identified prior to the start of any changes to any element, structural, mechanical, piping, electrical, etc. The GC is responsible for all coordination with new and existing conditions and shall have no claim for additional compensation regarding contractor – subcontractor coordination.

Z. The GC shall coordinate will all entity having jurisdiction and shall include all 3rd party commissioning and review costs such as special inspection requirements, wet sealed letters/reports, testing and inspection plans, reports/final reports and all related costs. Such costs shall be included in the schedule of values. The failure to research these issues and include these costs will be responsibility of the GC and his subcontractors and the Owner shall not be responsible for these costs/charges.

AA. The GC shall confirm compliance with *"Scope Gap"* which means contract work performed by the Contractor or Subcontractor that shall not allow additional charges to contract, charges to contingency and other charges. Scope Gap shall exclude differences in scope between the contractor and any subcontractor/supplier contract/invoice or agreement, shall exclude charges for any demolition, and shall exclude premium labor rates – including overtime, weekend work, shift differential, hot work, and holiday work. It shall exclude any interferences or obstructions, shall exclude site grading, paving, landscaping and shall exclude all CNG related service, hardware and software. The Contractor shall be responsible to inform all subcontractors and suppliers that all base contract requirements “flow down” through all contracts, agreements and invoices per the general conditions.

BB. The GC shall be responsible to carefully identify all existing field conditions and provide the Owner with accurate as-built drawings for all existing and new elements, installed equipment, UG and Above Ground issues.

1.4 SUMMARY OF WORK

The work for this Contract shall be phased so that existing compression (Total SCFM) at the Sunset Maintenance Facility (SMF) and Integrated Bus Maintenance Facility are NOT decreased during construction. Further, the work at the SMF site shall take priority over the work at the IBMF and the total compression shall be increased at the SMF site prior to the removal and relocation of the existing compressor skid to the IBMF site.

The General Contractor shall assure that the SMF work shall take priority and shall have no claim for compensation should the General Contractor encounter delays or monetary/ schedule impact in regard to increasing the current compression at the SMF site due to any unforeseen conditions.

The SMF Work shall include, but not be limited to the following;

Installed (3) new twin compressor skids, with all related piping, (5) new storage bottles with all structural steel framing/supports, removal of (1) existing CNG compressor skid and relocation to IBMF, (1) new prefabricated field office, new supply regulator(s). New supply ESD valves(s), new trolley beams, new access control/CCTV and related security equipment, electrical equipment – MSA, MSB, MSD, new lighting and all crane – rigging and related work, all concrete/electrical demolition and removals as required. The remainder of CMU wall and steel security wall, Topographical survey(s), UG surveys and investigations and all identification of all UG conflicts, interferences and issues. This work shall include all temporary power, temporary lighting and any temporary equipment needed/required to complete this work.

The work/requirements shall include all CNG equipment programming of new and existing CNG equipment, once programming is completed/prior to Substantial Completion, the GC shall be responsible for the maintenance of all new and existing CNG equipment, to include all faults, all alerts and all related issues with new and existing CNG related equipment.

The IBMF Work shall include, but not be limited to the following;

Installation of a (1) new twin compressor skids, with all related piping, (6) new storage bottles with all structural steel framing/supports, installation of (1) existing CNG compressor skid from the SMF site. (1) new priority valve panel, (3) new Paratransit dispensers, the removal of two existing Fixed Route dispensers and the installation of (2) new Fixed Route dispensers, Defueler modification, new supply regulator(s), new supply ESD valves(s), new trolley beams, new access control/CCTV and related security equipment, electrical equipment – MSE and related equipment. New lighting and all crane – rigging and related work, all concrete/electrical demolition and removals as required, remainder of CMU wall and steel security wall, Topographical survey(s), UG surveys and investigations and all identification of all UG conflicts, interferences and issues.

The work/requirements at both sites shall include all required concrete, mechanical, electrical and related demolition/removals, all crane work, rigging required to remove and install all new CNG and CNG related equipment, all labor, equipment and materials, all programming, all electrical work, all CNG process piping, all safety/security upgrades – CMU walls, steel wall, access control, CCTV, cameras. CNG programming, maintenance of CNG and CNG related equipment and shall include all CNG equipment programming of new and existing CNG equipment, once programming is completed and prior to Substantial Completion. The GC shall be responsible for the maintenance of all new and existing CNG equipment, to include all faults, all alerts and all related issues with new and existing CNG related equipment.

This work shall include all surveys, site/underground investigations, including: excavation, trenching, utilities protection, paving repairs for utility crossings, piping and conduits, sidewalk protection, landscaping repair, security equipment, split-system air-conditioning work, access control work, trench plating/protection, pull strings, hangers/supports and security devices.

The General Contractor shall be responsible to insure all contract requirements are included in their own and the subcontractor's contract and any failure to include any base bid and contract requirements is the responsibility of the general contractor. The RTC shall not be responsible to provide compensation from either Contingency or any other funding source for such issues.

The General Contractor is the responsible party to insure that the all contracts include all base bid and contract requirements e.g. all demolitions, all shutdowns, all overtime hours, weekend work, all hot work, all partial shutdowns and requests for removals and any such related work identified – including all scope gap related requests.

The Contractor shall assure proper coordination between all trades, sequencing, scheduling – overtime, hot work, shutdowns, cost effectiveness, and construction suggestions that will improve the overall Project.

The Contractor shall provide a written 1 year parts and labor warranty from the date of Substantial Completion for all CNG related equipment, compressors, dispensers, etc., installed in this contract, all costs associated with this warranty shall be included in the contractor's schedule of values. The warranty shall include operating issues, vibration issues, fueling issues and all issues not specifically covered under the existing CNG maintenance contract and shall be identified by a specific Warranty line item in the schedule of values.

The Contractor shall provide a written 5-year parts and labor warranty for all Division 28 – CCTV and ACAM equipment/programming/commissioning and systems warranty.

The Contractor shall provide a standard 1-year parts and labor warranty for all remaining equipment, systems and installations.

1.5 USE OF PREMISES

General: Contractor shall coordinate with the Owner and Bus Operator to identify a suitable area – as required/approved (see enclosed) – for the storage of materials, staging area. Contractor's use of existing premises is limited by the operations of vehicles, passenger service and transfers and shall be clearly defined based on the Contractor's proposed work sequence. The General Contractor shall include all costs related to the use of the existing premises and shall have no claim for compensation for this issue.

1.6 WORK SEQUENCE/STAGING

Before commencing Work, the contractor will submit a list of drawings, all related drawings and a detailed schedule showing the sequence, commencement dates and completion dates for the Owner's review and approval.

The GC shall perform a thorough UG investigation of new UG elements are to be installed and shall provide the results of this investigation to the RTC for review.

The General Contractor shall coordinate all base contract work, shutdowns, hot work, overtime, weekend work and related activities 72 hours in advance of the scheduled work. Failure to provide such advance notice is the responsibility of the General Contractor.

The General Contractor shall not perform any additional work, change order/contingency work prior to advance written approval from the Owner and within proximity of base contract work. As such, work shall be segregated from the base contract work and shall not interfere with base contract work or site operations.

The RTC has identified locations at both the Sunset Maintenance Facility (SMF) 5165 West Sunset Road, Clark County and at the Integrated Bus Maintenance Facility, 3120 Citizens Road, North Las Vegas for laydown/staging areas and this information is enclosed in the bid drawings.

The General Contractor shall not declare substantial completion until all requirements in the commissioning specification are completed, submitted reviewed, accepted and agreed to by the Owner. Substantial Completion shall only take place after final programming has been completed, demonstrated to be operable – minimum 5 calendar days and accepted by the Owner.

1.7 WORK RESTRICTIONS

General: Contractor shall coordinate with the Owner and Bus Operator to identify a suitable area as required/approved by the Owner for the storage of materials, staging area – see 1.6. Contractor's use of existing premises is limited by the operations of vehicles, passenger service and transfers and shall be clearly defined based on the Contractor's proposed work sequence.

The General Contractor shall be responsible to schedule hot work, overtime/weekend work, short shift work, shutdowns and all related CNG related work. The Contractor and subcontractors shall have no claim for additional compensation for any such work via contingency, change order or any other charge to this project. This includes Hot Work permits and compliance with all required OSHA regulations.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION 01 10 00

SECTION 01 25 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications and Contingency charges.

B. Related Sections include the following:

1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. The Regional Transportation Commission of Southern Nevada (RTC) will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on a form designated by Construction Manager.

1.4 PROPOSAL/CONTINGENCY REQUESTS

A. Owner-Initiated Proposal Requests: The Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by the Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Provide all identified documentation prior to the start of any change or contingency work. The contractor shall be responsible for all costs, equipment, labor/labor charges, delays and related impacts should the general contractor start such change/contingency work without prior written approval.

B. Contractor-Initiated/Contingency Proposals: The contractor shall not commence with any contractor-initiated/contingency work without the review and written approval of the Owner. If the contractor proceeds with such work without prior notification/approval from the Owner, the contractor shall be responsible for the costs and delays that this change order work may incur. The contractor shall not submit a Contractor Initiated proposal that is missing labor rates, invoices, bills of lading and all related supporting documentation that is related to that proposal. The Contractor shall provide all back up documentation prior to requesting a “meeting” or negotiation, and shall have no claim for compensation for any Contractor-Initiated Change/Contingency or other related request for compensation should the contractor fail to provide the required documentation.

If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Construction Manager, prior to the start or initiation of any work, in writing. The general contractor and his subcontractors, waive their right for compensation, should such claimed additional work start without the Owner’s, knowledge or consent.

The contractor shall not initiate, track or identify “contingency charges/changes” prior to written approval and direction from the Owner for all such changes. These changes shall not be “labor and material” changes. Any such changes will be rejected and the general contractor shall be responsible for all identified costs, charges to labor and material changes.

If the contractor seek to change any design element shown in the documents, drawings or specifications, without previous approval from the Owner being provided to the Contractor in writing prior to implementing any changes. The Contractor shall provide design drawings and details for all such changes that are inconsistent with the approved construction drawings, specifications. The Contractor shall submit wet sealed drawings, documents to support these noted changes and shall be approved by the authority having jurisdiction when warranted.

The contractor shall assure that all electrical design documents/requirements related to ANGI’s provided equipment and inter connection drawings are accurate prior to submission. As construction issues, changes to conduit routing, electrical rough-ins and related electrical work shall be the responsibility of the GC and all coordination of such work shall be the responsibility of the GC. The GC shall have no claim for compensation for these issues.

The contractor shall not be compensated or seek compensation via contingency/ change orders for issues, changes or differences between the Owner's contract with the GC and the GC's contract's with subcontractors, suppliers and all contracts, without prior written approval. The GC shall be responsible for all relates costs, charges in regard to any/all differences, changes or issues arise between the Owner's - GC's contract and the subcontractor/suppliers contract the GC shall be responsible for all costs and related issues. This issues, include but are not limited to, request for overtime, extra time, weekend/holiday work, out of scope and scope gap issues – Owner /GC contract includes all overtime, extra time, such requests will be denied compensation through any form including change order, contingency, etc. Other such requests for compensation for partial shift work, hot work, any/all shutdowns, shall also be denied as the Owner /GC contract includes all such requests. These requests will be denied compensation through any form including change order, contingency, etc. The GC shall not seek or be reimbursed for claimed additional work by the GC subcontractor or any entity that this is party to the GC.

The GC shall be responsible to assure that all Bid and Base Contract/Issued for Construction documents and requirements are included in the GC's contract with all subcontractors, suppliers and shall not seek/or receive compensation for GC's failure to include all general conditions and contract requirements in these contracts.

The Owner shall be held harmless from all requested compensation and the GC shall not seek reimbursement through any form – change order, contingency, etc. should the GC ignore these requirements, such requests will be denied without review or consideration. The GC is responsible for the contract and contract requirements between the GC and all subcontractors, suppliers, etc. Should the GC fail to ensure that all base contract requirements "flow down" to all second tier contracts, then the GC/Contractor shall be responsible for all related costs, schedule impacts and operations impacts.

Identified below are some of the typical examples that the Contractor cannot claim as additional compensation/contingency changes/charges, as well as the steps to be taken prior to the start and approval of such change/contingency work.

1. Underground and subsurface contractor-initiated proposals, to the contingency/ compensation for subsurface interferences, footing changes, underground work, etc. will not be considered as the Contractor is responsible for all field surveys and the identification of such conflicts. These conflicts, interferences and changes are to be identified during the preconstruction phase, by the contractor, and the contractor shall not be compensated for failing to identify these subsurface/underground issues. Such elements are to be included in the base bid, contract set and final GMP and the contractor shall be responsible for all costs, all charges, all permit changes/charges and shall have no claim for compensation.

2. Demolition and removal proposals shall not be considered change/contingency work, this includes all labor, materials, equipment, removals, for all concrete, electrical, mechanical, structural, steel and related demolition activities and related charges and are the responsibility of general contractor/GC and subcontractors.

3. Crane, rigging, piping, electrical, mechanical, piping and all related charges, costs and expenses shall not be considered change/contingency work, this includes all labor, materials, equipment, removals, installations and related charges and are the responsibility of general contractor/GC and subcontractors. The removal and reinstallation of CNG compressors shall include all electrical connections, CNG and mechanical connections (removals and reinstallations) and all related work to remove and reinstall equipment.
4. CNG programming and all related work, charged, costs and expenses shall not be considered change/contingency work, this includes all labor, materials, equipment, removals, installations and related charges and are the responsibility of general contractor/GC and subcontractors.
5. Any damage to new and existing systems, equipment and facilities caused by the general contractor/GC and all subcontractors shall not be considered change/contingency work, this includes all labor, materials, equipment, removals, installations and related charges and are the responsibility of general contractor/GC and subcontractors.
6. All site grading, paving, landscaping, relocation/height adjustments to all concrete pads, supports, foundations shall not be considered change/contingency work, this includes all labor, materials, equipment, removals, installations and related charges and are the responsibility of general contractor/GC and subcontractors.
7. All CNG relates services, hardware, software as necessary and required to implement and operate the new/existing CNG fueling system shall not be considered change/contingency work and is the responsibility of the general contractor/GC and subcontractors.
8. All electrical installations and demolition that occur during construction, the GC shall review all design documents and assure that all electrical installations are clear of interferences and possible conflicts and shall have no claim for compensation.
9. All charges for premium time, overtime, shift differential, partial time and hot work, weekends, holidays shall not be considered change/contingency work, and are the responsibility of the general contractor/GC and subcontractors.
10. The removal and relocation of all existing CNG and CNG related equipment such as SMF Skid removal and relocation from the SMF site to the IBMF site. The contractor shall include all costs related to this work, e.g. rigging, skating, cranes, chain falls, hoists, labor, materials and coordination with all subcontractors. This shall include removal and reinstallation costs, charges and related rigging.
11. The contractor shall include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time, prior to the start of any change/contingency work.
12. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
13. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
14. Include costs of labor and supervision directly attributable to the specific change.
15. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

16. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use form included designated by Construction Manager.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Construction Manager will issue a Change Order for signatures of Owner and Contractor on form included per the General Conditions.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: the Construction Manager may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A signed statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule. The Schedule shall be in a format approved by the Construction Manager.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with Continuation Sheets.
    b. Submittals Schedule.
    c. Progress Photos,
    d. Red line drawings
    e. Contractor's Construction Schedule.

2. Submit the Schedule of Values to Construction Manager no more than 15 days after Notice to Proceed for review and approval.

3. The General Contractor shall submit an un-notarized Pencil payment application with each and every month’s application that is submitted for processing. The Pencil shall be reviewed, signed and returned by the Owner to the General Contractor prior to the submission of the Final payment application.

4. The General Contractor shall submit progress photos with each FINAL payment application

5. The General Contractor shall submit/produce all red line drawings for RTC review with each payment application for review. Failure to provide/produce these red line drawings will delay the processing of each payment application and the General Contractor shall be responsible for these drawings.

6. The General Contractor shall submit all final red line drawings with the Final Invoice and part of the Final Payment. Failure to provide/produce these drawings will delay processing of this payment. These drawings are to be submitted via hard copy and pdf/zip drive copy to the Owner for review and acceptance.

7. The General Contractor and all subcontractors/suppliers and vendors performing work on this project shall have no claim for additional compensation for the generation, maintenance and submittal of these red line drawings.

8. The General Contractor shall not submit any future (next month) payment application is until the current/previous month's payment application has been review, approved and processed.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name/number and location.
   b. Contractor's name and address.
   c. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.

      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not installed.

    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be either shown as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Construction Manager and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Progress payments shall be submitted to the Construction Manager as stated in GC 29. The period covered by each Application for Payment is one month, ending on the last day of each month.

C. Payment Application Forms: Use AIA format or similar format.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 2 signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. All copies shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.
16. Initial settlement survey and damage report if required.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination/Shop (As Built) Drawings.
2. Deferred Submittals.
3. Administrative and supervisory personnel.
4. Project meetings.
5. Requests for Interpretation (RFIs).

B. Related Sections include the following:

1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
2. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: The GC/contractor shall be responsible to coordinate all construction operations, field activities, identify shutdowns, including deferred submittals, wet sealed drawings review and submittal, fabrication of construction elements, coordination with subcontractors, suppliers, and all entities to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, with SW Gas, NV Energy, LVVWD and entities having jurisdiction. This coordination shall include contract work in different contract Specification Sections that depend on each other for proper

installation, coordination, connection, and operation. This coordination also includes all removals, demolition, rigging, crane operations, all demolition activities and all contract related work.

1. Schedule construction operations, installations and sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation. If the work requires working after hours, shift differentials, hot work and weekends, the GC shall be responsible for all coordination, all related costs, labor, equipment, cranes and related charges. The Owner shall not be charged for this work and the contractor is responsible to coordinate these activities.

2. The GC and all subcontractors are responsible to perform field investigations to assure all Design Documents are accurate and constructible. The failure to perform these tasks shall not relieve the GC and all subcontractors of these responsibilities and these parties shall have no claim for compensation for any/all field discrepancies encountered/identified during construction.

3. The GC shall coordinate with RTC's 3rd Party CNG Contractor (Trillium), ANGI and all related suppliers to provide all interconnection drawings, details and related electrical work. The GC shall have no claim for additional compensation during the construction phase any work related to these interconnection drawings, details and related electrical work. Failure to not provide such details is the responsibility of the GC and his subcontractors.

4. The GC shall be responsible to coordinate all programming and shall provide the required Master Control Plan programming and Master Control Plan narrative. This plan shall include/identify each installation – party responsible – and shall be included in the project schedule. This plan shall also include all startups and related lists of required maintenance and or repairs to assure the system remains operational.

5. The GC shall not make claim or request compensation for any damage to new or existing/uncovered surfaces, ground wire, concrete removal and replacement that may occur during construction activities. Such damage is the responsibility of the GC to identify, provide protection, identify to all parties and assure all repairs are made at no cost to the Owner. The GC is responsible to identify and factor such issues into the bid documents.

6. The GC is responsible for his means and methods and should any damage or shutdowns take place as a result of this failure to properly supervise field activities, then the GC shall have no claim for compensation. The GC is responsible to provide field supervision for all field activities per the contract requirements and the GC is responsible to supervise these activities.

7. The GC shall schedule and coordinate all hot work and welding within the CNG Fueling areas at each site. This work may be performed during a 6-hour window (2 hours prep and 4 hours actual work) during the typical work week – Monday thru Friday and all bidders and subcontractors shall be notified by the GC of this requirement to be included in the contracts. The GC shall have no claim for compensation for any additional, missed or scheduled hours that were billed, e.g.

subcontractor's minimum work period is a typical 8, 7 or 6-hour work day and only 4 hours are worked during hot work or welding. The GC shall be responsible for this coordination and all related costs associated with this work.

8. The GC shall have no claim for compensation regarding any site work, down time for all shutdown, hot work and welding. The GC shall make no assumptions and shall base all shutdown, hot work and welding periods based on actual approved hours. The RTC is not responsible for any assumptions made by the GC and his subcontractors and the RTC shall not be responsible for any compensation requested based on these assumptions.

9. The GC shall make no claim for additional compensation for any base contract work that was not "bought out" or coordinated with the respective subcontractor during bid. The GC is responsible for all costs associated with the coordination of all base contract work and shall have no claim for additional compensation, this includes but is not limited to crane work rigging, skating and all related installations and removals. Per the contract, requirements that GC shall review and assure all flow down requirements and contract requirements are include in all contracts, without exception.
10. The SMF and IBMF facilities are open 24 hours per day, 7 days per week all year long. The contractor shall make note of this fact and coordinate/plan accordingly.
11. The GC shall submit a sequencing plan that includes all identified CNG upgrades work, including the removal and replacement of existing equipment, staging area(s), placement of dumpsters, cranes, related equipment and the coordination with the RTC and all affected third party contractors. This plan(s) shall be submitted to the Owner for review and approval prior to the start of all related work. All work at the SMF site shall take precedence over work at the IBMF site and the Contractor shall identify this in the baseline project schedule.
12. The GC shall not request substantial completion until all commissioning requirements have been completed and the Final CNG systems and equipment (Phase A and Phase B) have been tested and accepted by the Owner.
13. The GC/contractor is required to assure that the means and methods used to perform the base contract work does not damage equipment, tools, systems and conduit located at each site. The contractor may be required to respond to inquiries and emergencies that result from this work and shall respond immediately.
14. Means and methods are the responsibility of the GC and their subcontractors.
15. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
16. The GC shall be responsible for conflicts of fabricated work, installed work and issues that arise due to these conflicts, including all costs related to the correction of such conflicts. The GC shall have no claim for compensation via either contingency, change or other form related to these conflicts and the noted corrections.
17. The GC is responsible for all demolition work, including electrical, mechanical, gas, concrete and all related removals. These costs shall be included in the schedule of values and the failure to identify and include all demolition is the responsibility of the GC.

18. The GC shall carefully review the IBMF and SMF site Geotech reports and identify all issues that shall impact construction and site operations. The contractor shall include all costs associated with these Geotech reports.
19. The GC is responsible for all coordination work between subcontractors and installed elements and shall no claim for additional compensation should such instances arise or be identified. The use of coordination drawings and strict adherence to all contract requirements shall assure such issues are resolved without additional costs or impact.
20. The GC shall make adequate provisions to accommodate items scheduled for later installation.
21. The GC shall carefully review all provided as-built drawings and information and shall identify all issues that shall impact operations
22. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings. The GC shall incorporate all comments, changes and additions to all distributed meeting minutes and update/distribute these meeting minutes prior to the next meeting. Failure to perform these tasks in a thorough and accurate manner will result in the GC being in non-compliance with the base contract requirements an NCR (Non Conformance Report) shall be issued by the Owner documenting this failure and the corrective action to be taken by the GC to assure non-recurrence.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. E2020 will provide the Project Management Information System (PMIS). The Contractor is required to use the RTC's internet based collaborative PMIS website, managed by E2020 Technology, Inc., to conduct all day to day communication and collaboration with other project team members. This use shall include all submissions to the Engineer and the Inspector including but not limited to daily report, shop-drawing submittals, RFI, Change Order request. The contractor shall equip the fieldsite office with a computer and a broadband connection such as a DSL or broadband wireless connection suitable for accessing the project management website and shall maintain this connection thru the course of construction and closeout.

1.5 SUBMITTALS

A. Submittal log: Prepare and submit for review a detailed submittal log per CSI and submit this document to the Construction Manager not more than 30 Days after Notice to Proceed.

B. Coordination/Shop Drawings: Prepare and submit for review Coordination/Shop Drawings for all mechanical work, compressor work, CNG equipment removals and installations, all electrical work, all wiring diagrams, single line diagrams. Including all excavation, trenching and backfilling, all masonry wall excavation and installations, all demolition, including removals and relocations prior to the start of any identified work prior to the start of such work. If limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for, installation of products and materials fabricated for each facility and by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate required installation sequences.
    c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-12 by 11 inches but no larger than 30 by 40 inches (750 by 1000 mm).

3. Number of Copies: Submit three opaque copies of each submittal. Construction Manager will return one copy.

    a. Submit five copies where Coordination/Shop Drawings are required for operation and maintenance manuals. Construction Manager will retain four copies; remainder will be returned.

4. All coordination/shop drawings, once the referenced work is executed and completed shall be submitted as As-Built drawings to the Owner for review.

5. All coordination/shop/as built drawings shall not be provided/submitted on the bid or contract drawings. The contractor may use the contract drawing backgrounds, but marked up/modified contract drawings shall not be provided for review.

6. As-built drawings shall be clearly identified as “As built” on each drawing.

7. As-built drawings shall be generated for all drawings that identified any changes, discrepancies from the approved base contract drawings and must be annotated on each drawing with the change, request for information, bulletin, etc. that created/caused the noted change.

C. Key Personnel Names: Within 15 days of construction award, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Superintendent: The Contractor shall designate a superintendent who shall be employed by the Contractor and shall be authorized to act on behalf of the Contractor, to receive contract modifications, and be responsible for informing others in Contractor’s employ or subcontractors of changes to the Work.

   a. Contractor shall not replace superintendent except in case of emergency as approved by the Owner. Any subsequent substitution, if approved, will require full-time presence on-site of Contractor’s project manager in addition to superintendent.
   b. Superintendent shall be present at Site for a minimum of eight (8) hours each day that construction work is progressing, or that is a normal business day until all punch list items have been completed. The superintendent shall also be present at the Site during all work performed at other than the above listed times.
   c. The Contractor shall arrange to have the superintendent available by cellular phone and/or radio on a 24-hour a day, seven days a week basis throughout the term of the construction contract.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Construction Manager and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Construction Manager to record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, within 24 hours of each meeting.
    a. Incorporate all comments, changes and issues to each meeting minutes without exception and distribute these revised minutes at least 36 hours prior to the next weekly bi-weekly meeting.
    b. Should the author make changes because of the comments received, than the attendees shall have an opportunity to review and offer additional comments and changes prior to the next meeting and the minutes will not be considered final until all open comments, changes are incorporated.
    c. Distribute all Final minutes once all parties have agreed these minutes are final.

B. Preconstruction Conference: Owner shall schedule a preconstruction conference before starting construction, at a time convenient to Construction Manager, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Contractor to discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Procedures for processing field decisions and Change Orders.
    e. Procedures for RFIs.
    f. Procedures for testing and inspecting.
    g. Procedures for processing Applications for Payment.
    h. Distribution of the Contract Documents.
    i. Submittal procedures.
    j. Preparation of Record Documents.
    k. Owner's occupancy requirements.
    l. Responsibility for temporary facilities and controls.
    m. Parking availability.
    n. Office, work, and storage areas.
    o. Equipment deliveries and priorities.
    p. First aid.
    q. Security.
    r. Progress cleaning.
    s. Working hours.

3. Minutes: record meeting minutes and distribute minutes of the current meeting, no later than 24 hours, to each party present and to parties who should have

been present, if the meetings take place weekly. Distribute no later than 3 calendar days if the meetings take place every other week.

a. Incorporate all comments, changes and issues to each meeting minutes without exception and distribute these revised minutes at least 36 hours prior to the next weekly bi-weekly meeting.
b. Should the author make changes because of the comments received, than the attendees shall have an opportunity to review and offer additional comments and changes prior to the next meeting and the minutes will not be considered final until all open comments, changes are incorporated.
c. Distribute all Final minutes once all parties have agreed these minutes are final.

4. Schedule Updating: revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

C. Pre installation Conferences: Contractor to conduct a pre installation conference at Project site before each construction activity that requires coordination with other construction at least 1 week prior to the start of each activity.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Related RFIs.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Guarantee requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Installation procedures.
u. Coordination with other work.
v. Required performance results.
w. Protection of adjacent work.
x. Protection of construction and personnel.

y. Access to utility easements by utility companies.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of the Owner and the Construction Manager, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

3. Minutes: record meeting minutes and distribute minutes of the current meeting, no later than 24 hours, to each party present and to parties who should have been present, if the meetings take place weekly. Distribute no later than 3 calendar days if the meetings take place every other week.
   a. Incorporate all comments, changes and issues to each meeting minutes without exception and distribute these revised minutes at least 36 hours prior to the next weekly bi-weekly meeting.
   b. Should the author make changes because of the comments received, than the attendees shall have an opportunity to review and offer additional comments and changes prior to the next meeting and the minutes will not be considered final until all open comments, changes are incorporated.
   c. Distribute all Final minutes once all parties have agreed these minutes are final.

4. Schedule Updating: revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with the Contractor. RFI's submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

3. The GC shall not submit an RFI for preconstruction work that was missed or omitted and these RFI's shall be deemed frivolous.

B. Frivolous RFIs. Contractor will be assessed the cost of the Construction Manager and design professional's time and materials for unnecessary or frivolous RFIs.

C. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Construction Manager.

5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor has suggested solution(s). If Contractor's solution(s) affect the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, As-Built Drawings and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

D. Hard-Copy RFIs: Form at end of this Section.

1. Identify each page of attachments with the RFI number and sequential page number.

E. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

F. Construction Manager's Action: Submit RFIs to Construction Manager will review each RFI, determine action required, and return it. Allow seven working days for response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned by the Construction Manager without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Action may include a request for additional information, in which case time for response will start again.

3. Action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Construction Manager in writing within 5 days of receipt of the RFI response.

G. On receipt of Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Construction Manager within five days if Contractor disagrees with response.

H. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Construction Manager.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 01 32 20

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Periodic construction photographs, every 2 months progress.

B. Related Sections include the following:

1. Division 1 Section "Submittal Procedures" for submitting photographic documentation.

1.3 SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph prior to each payment application. Include same label information as corresponding set of photographs to the Owner.

B. Construction Photographs: Submit three prints of each photographic view with every payment application during the duration to the Owner for review and record with each identified payment application to the RTC.

1. Format: 8-by-10-inch full-color image prints on 8 ½ inch by 11 inch single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.

2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

a. Name of Project.
b. Contract Number
c. Phase.
d. Orientation of view.
e. Date photograph was taken.
f. Name and address of photographer.
g. Photographer’s numbered identification of exposure.

3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped during each two-month period and for the entire project and as a complete package.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects and is acceptable to the Owner.

1.5 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Periodic Construction Photographs: Take photographs monthly as evidence of existing project conditions. Select vantage points to show status of construction and progress since last photographs were taken.

END OF SECTION 01 32 20

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 1 Section "References" for applicable industry standards for products specified.
2. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product. The RTC requires the submittal of all shop drawings, as built drawings, all electrical underground drawings, all electrical, programming and related point I/O's – of the final installation.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.

2. Form: Tabulate information for each product under the following column headings:

    a. Specification Section number and title.
    b. Generic name used in the Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.
    h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 calendar days after date of commencement of the Work, submit 5 copies of initial product list per submittal log. Include a written explanation for omissions of data and for variations from Contract requirements.

    a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 60 calendar days after date of commencement of the Work, submit 5 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.

5. Construction Manager's Action: Construction Manager will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided by Owner.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified material or product cannot be provided.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
    j. Cost information, including a proposal of change, if any, in the Contract Sum.
    k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
    l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Construction Manager’s Action: If necessary, Construction Manager will request additional information or documentation for evaluation within 7 calendar days of receipt of a request for substitution. Construction Manager will notify Contractor of acceptance or rejection of proposed substitution within 15 work days of receipt of request, or 7 calendar days of receipt of additional information or documentation, whichever is later.

    a. Form of Acceptance: Change Order.
    b. Use product specified if Construction Manager cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Construction Manager's Action: If necessary, Construction Manager will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Construction Manager will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."

    b. Use product specified if Construction Manager cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store cementitious products and materials on elevated platforms.

5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents. The Contractor shall provide a 1 year parts and labor warranty from the date of Substantial Completion for all CNG equipment, compressors, dispensers, etc., installed in this contract, all costs associated with this warranty shall be included in the contractor’s schedule of values. The warranty shall include operating issues, vibration issues, fueling issues and all issues not specifically covered under the existing CNG maintenance contract.

A. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

1. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.

8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Construction Manager will consider requests for substitution if received within 10 calendar days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Construction Manager.

B. Conditions: Construction Manager will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Construction Manager will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Construction Manager and Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.

4. Substitution request is fully documented and properly submitted.

5. Requested substitution will not adversely affect Contractor's Construction Schedule.

6. Requested substitution has received necessary approvals of authorities having jurisdiction.

7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.

9. Requested substitution provides specified warranty.

10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Conditions: Construction Manager will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Construction Manager will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Substantial completion
3. Warranties.
4. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Division 1 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
6. Divisions 2 through 41 Sections for specific closeout and related requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, the Contractor shall complete the following. List items below that are incomplete in request.

1. Complete all tasks identified in Commissioning Specification 01 91 13, the GC shall not declare or schedule substantial completion until all tasks identified in this specification are completed, submitted, reviewed and approved by the Owner.
2. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

3. Perform programming on all new and existing CNG equipment and provide the Owner with written documentation to support that the programming has been completed and is acceptable.
4. Provide the Owner with all test results of all CNG equipment and systems.
5. Advise Owner of pending insurance changeover requirements.
6. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
7. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
8. Prepare and submit As Built Drawings/Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
9. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
10. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
11. Complete startup testing of systems.
12. Submit test/adjust/balance records.
13. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
14. Advise Owner of changeover in utilities.
15. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
16. Complete final cleaning requirements, including touchup painting.
17. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion to the Construction Manager no more than 72 Hours prior to the scheduled Inspection. On receipt of request, Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Construction Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected and the full use of the facility must be recognized prior to the issuance of substantial completion certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Project Manager’s Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect.

The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. The Contractor shall complete all open punch list items identified during substantial completion within 30 Calendar Days prior to the issuance of Final Acceptance.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Construction Manager will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Construction Manager.
    d. Name of Contractor.
    e. Page number.

1.6 WARRANTIES

A. The Contractor shall provide a 1 year parts and labor warranty from the date of Substantial Completion for all CNG equipment, compressors, dispensers, etc., installed in this contract, all costs associated with this warranty shall be included in the contractor’s schedule of values.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 01 78 10

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record, Shop Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 1 Section "Closeout Procedures" for general closeout procedures.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 2 through 41 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: The Contractor and all subcontractors shall submit one set of plots from corrected Record CAD Drawings and one set of marked-up Record Prints. Construction Manager will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Construction Manager will return plots and prints for organizing into sets, printing, binding, and final submittal.

b. Final Submittal: Submit one set of marked-up Record Prints, one set of Record CAD Drawing files, one set of Record CAD Drawing plots, and three copies printed from record plots. Plot and print each Full Size Drawings, whether or not changes and additional information were recorded.

1) Electronic Media: CD-R.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD – AS-BUILT DRAWINGS

A. Record Prints: The Contractor shall maintain one set of blue- or black-line white prints of the Contract Drawings, all related Shop and As-Built Drawings.

1. Preparation: Mark Record – As-Built Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Project Manager’s written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

1. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

2. Mark record/as-built sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Construction Manager. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
2. Format: DWG.
3. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect through Construction Manager for resolution.
5. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.

    a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.

C. Newly Prepared Record/As-Built Drawings: The Contractor shall prepare new Drawings instead of preparing Record/As-Built Drawings where Construction Manager determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Construction Manager for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: The Contractor shall identify and date each Record/As-Built Drawing; include the designation "PROJECT RECORD/AS-BUILT DRAWING" in a prominent location.

1. Record Prints: Organize prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.

4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD/AS-BUILT DRAWINGS."
    d. Name of Architect and Construction Manager.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. The Contractor shall provide a 1 year parts and labor warranty from the date of Substantial Completion – for all CNG equipment, compressors, dispensers, etc., installed. All costs associated with this warranty shall be included in the contractor’s schedule of values for record purposes.

B. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record/As-built Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Construction Manager's reference during normal working hours and provide such drawings to the Owner for record purposes.

END OF SECTION 01 78 10

SECTION 01 78 20

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Warranty
3. Emergency manuals.
4. Operation manuals for systems, subsystems, and equipment.
5. Maintenance manuals for the care and maintenance of products, materials, finishes and systems and equipment.

B. Related Sections include the following:

Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
Divisions 2 through 41 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion of the requested equipment systems. Include a complete operation and maintenance directory. Construction Manager will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit two copies of each manual in final form at least 15 days before final inspection. Construction Manager will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Construction Manager's comments. Submit 3 copies of each corrected manual within 15 working days of receipt of Construction Manager's comments.

1.5 COORDINATION

A. The GC shall not request substantial completion until all commissioning requirements have been completed and the Final CNG systems and equipment (Phase A and Phase B) have been tested and accepted by the Owner.

B. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

C. Upon issuance of Substantial Completion, closeout of the project shall commence as shall the submittal of all operations and maintenance manuals.

1.6 WARRANTY

A. The Contractor shall provide a 1 year parts and labor warranty from the date of Substantial Completion for all CNG equipment, compressors, dispensers, etc., installed at each site of this contract, all costs associated with this warranty shall be included in the contractor's schedule of values. The warranty shall include operating issues, vibration issues, fueling issues and all issues not specifically covered under the existing CNG maintenance contract. The warranty costs shall be identified as a separate line item in the schedule of values.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Construction Manager.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm)

paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.

5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams/Operating Logic.
8. Piped system diagrams.
9. Precautions against improper use.
10. HVAC/Duct Drawings.
11. Approved Coordination Drawings, as required.
12. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.

4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.
10. Spare/critical parts and functions.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

F. HVAC/Duct Systems, as installed including all volume dampers, fire/smoke dampers, VAV’s, AHU’s, etc.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.

3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

G. Comply with Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation and Owner’s direction.

END OF SECTION 01 78 20

SECTION 01 82 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training videotapes.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for requirements for pre instruction conferences.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit two complete training manuals for Owner's use.

2. All demonstration and training sessions shall be videotaped and that media submitted to the Owner

B. Qualification Data: For facilitator – name, address and qualifications.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Demonstration and Training Videotapes: Submit two copies of each video to the Owner for review and approval within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

    a. Name of Project.
    b. Name and address of photographer.
    c. Name of Construction Manager.
    d. Name of Contractor.
    e. Date videotape was recorded.
    f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

3. Video Tape each individual session as directed by the Construction Manager.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
    1. Inspect and discuss locations and other facilities required for instruction.
    2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid
    delays.
    3. Review required content of instruction.
    4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, included but not limited to following:

1. Motorized doors, including overhead coiling and sectional doors.
2. Maintenance equipment, including vehicle lifts, paint booth equipment and systems, vehicle wash equipment and systems, parts and tool lifts, fueling equipment and systems, and traffic control devices.
3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
4. Gas detection systems.
5. Automated Fare Retrieval systems.
6. Vehicle management systems.
7. Intrusion detection systems.
8. Conveying systems, including parts and tool lifts and cranes.
9. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
10. HVAC instrumentation and controls.
11. Electrical service and distribution, including transformers switchboards, panelboards and motor controls.
12. Packaged engine generators, including transfer switches.
13. Lighting equipment and controls.
14. Communication systems, including voice and data equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Coordinate with the RTC for an approved date, time and location to perform all demonstration and training. Provide all needed and necessary equipment to complete the demonstration and training.

1. Schedule training with Owner with at least fourteen days' advance notice.

D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 82 00

SECTION 01 91 13 – CNG COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY OF EQUIPMENT AND CNG REQUIREMENTS

A. Related Documents and tasks to be provided and tasks to be performed:

1. All Contract Drawings and general provisions of the Contract apply to this Section.
2. All current and new programming and programming documentation shall be submitted. Additionally, new programming in forms of narrative and PLC language shall be provided as part of this contract. This shall include all preliminary and final programming.
3. Interconnection drawings and details shall be submitted as part of this project and these shall include all new and existing information, CNG equipment, interconnection details, and all final CNG related information/installations.
4. Performance and demonstration of the connectivity of the CNG system at/to RTC Field Offices as part of this contract in the presence of the Owner.
5. The contractor shall provide a list of all repair and maintenance items that have occurred and may occur.
6. The contractor shall provide complete commissioning checklists that are to include the new PLC programing, all retrofitted/existing CNG equipment with Point I/O's and analog vibration sensors/ transmitter and shall include points for verification of all terminations, IP addresses, etc.
7. Compliance with all authority having jurisdiction requirements including hiring 3rd party engineers to review all design and testing information and all North Las Vegas/Clark County special inspection requirements. This shall include all schedule impacts, documentation, fees and all related costs and shall be include in the schedule of values.
8. Provide all master PLC Narratives, in writing, in compliance with the all requirements and identify and deviations from the existing site narratives.
9. Provide a listing of all normal wear and tear on the CNG equipment and assure all related costs are included in the schedule of values and all related subcontractors contracts. The GC shall no claim for compensation for is failure to not include these costs in the schedule of values/all subcontracts.
10. Provide a breakdown of all shutdowns, hot work and related CNG fueling interruptions at both sites and include all costs for overtime, extra work, weekend, shift differential for this and all related work. The GC shall have no claim for compensation for the failure to not include these costs in the schedule of values/all subcontracts.
11. Provide all Operation and Maintenance Manuals for all CNG and CNG related equipment for this project.
12. Provide all shop and field testing and startup documentation for all installed CNG equipment at both sites.
13. Provide all shop and field inspections, testing and acceptance documentation for all installed CNG equipment.
14. All operational documentation – completed and verified regarding the warranty.
15. and any warranty issues that have taken place during this project.
16. All instrumentation and controls, including ESD operations for all CNG equipment.
17. All Motor starter panel documentation for all CNG related equipment.
18. All Factory test results of all CNG and CNG related equipment.

19. Documentation of functional testing.
20. All Performance testing – including Final test results and all calculations performed at both sites.
21. Temperature Compensation test results.
22. Initial and Final Vibration analysis reports for all CNG equipment, performed at both sites.
23. Proportional Flow Dispenser Test Results on all paired CNG dispensers installed during this project (as applicable).
24. Documentation of reliability tests.

B. Required Manufacturers and Services.
   1. Main Equipment. All CNG compressor skids, valve panels, motor-starter assemblies, and dispensers shall be provided by ANGI Energy Systems. Startup and commissioning of all ANGI-supplied equipment shall be supervised by technicians employed by ANGI or by technicians that are approved by ANGI to perform such work.
   2. Automation. All PLC programming, connections and modifications shall be performed by technicians employed by Trillium CNG.

C. Section Includes:
   1. General requirements that apply to implementation of testing, acceptance and commissioning of new and modified compressed natural gas (CNG) fueling systems, assemblies and components that are to be commissioned as one complete system at both sites. The Contractor shall not declare Substantial Completion until all commissioning documents, requirements and identified tasks have been completed by the Contractor and submitted to/accepted by the Owner. The Owner shall either accept or provide written comments on documentation from the Contractor within five business days of each submittal referenced in this paragraph.
   2. All related programming and interconnection drawings and details shall be completed and accepted by the Owner prior to the issuance of Substantial Completion.

D. Related Sections:
   1. Division 43 Section “CNG Equipment” and “CNG Construction”.
   And all related sections.

E. Criteria for Reliability Test

Table of Test Criteria

#	Fault	Criteria
1	Final Discharge Pressure High Fault	C
2	Suction Inlet Pressure High Fault	C
3	Suction Inlet Pressure Low Fault	N
4	Compressor Vibration High Fault	C
5	Cooler Vibration High Fault	C
6	Compressor Motor Fault	C
7	Receiver Tank Pressure Broken Wire Fault	C

8	Receiver Tank Pressure - High Fault	N
9	Any Stage Pressure Broken Wire Fault	C
10	Any Stage Discharge Pressure High Fault	C
11	Any Stage Temperature High Fault	C
12	Any Stage Discharge Pressure low Fault	C
13	Any Stage Temperature low Fault	N
14	Final Discharge Pressure Broken Wire	C
15	Pre Lube Min Pressure Overtime Fault	N*
16	Pre Lube Pressure Overtime Fault	N*
17	Pre Lube Motor Fault	C
18	Fan Motor Fault	N
19	Oil Level Low Fault	N
20	Compressor oil temperature fault	C
21	Maximum Starts per Hour exceeded Fault	N*
22	ESD fault	N*
23	Local kill switch fault	N
24	Any Stage Temperature Low Fault	C
25	Gas leak detection	C
26	Cooler fan temperature high fault	C
27	Cooler temperature low fault	C
28	Control air pressure high fault	N
29	Control air pressure low fault	N
Criteria	**Remedy**	
C	Critical: Test failed and needs to be repeated after problem is fixed.	
N	Noncritical: Fix the problem and verify cause of fault is resolved.	
4 x N	If 4 or more faults with N criteria occur, test may be considered as failed.	
*	Determine cause. May trigger retest depending on nature of problem.	

1.2 REFERENCES

A. General:
   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection and highest standard shall apply in all instances.
   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
   3. Refer to Division 43 Section "CNG Equipment" and “CNG Construction” for codes and standards, and other general requirements.

1.3 DESCRIPTION

A. Purpose. All CNG systems, equipment and all related hardware shall be factory tested and approved. Shall be operational tested and approved, and shall be programmed and commissioned in order to achieve the following specific objectives:

1. Verification and documentation, as submitted to the Owner, that all CNG systems/equipment as installed, started, and operates properly pursuant to the requirements of the contract documents and manufacturer's specifications, instructions and recommendations. This includes the testing, verification and documentation regarding the daily operation of the CNG programming to control all equipment at both sites.
2. To verify and document that all CNG equipment, systems and related equipment is operating effectively and fueling within the specified time frames. This shall include a thorough review of all programming and documentation that the completed CNG systems for this project and all previously installed CNG equipment are operating as specified.
3. This verification shall include the Owner's review and approval of all start up services. The contractor shall have no claim for compensation for any start up failure of any/all CNG equipment at both SMF and IBMF sites. The GC is responsible for all coordination, all installations, and the verification of all operations.
4. The GC shall identify and document all deficient systems/equipment and installations as early as possible to facilitate timely corrective action minimizing negative schedule impacts at both sites.
5. The GC shall notify the Owner of all deficiencies at both sites that negatively impact fueling operations and document the deficiency and corrective taken and promptly submit to the Owner.
6. The GC shall notify the Owner of all alerts, alarms and any/all programming changes and shall not reset, change or update any software or hardware settings, programming or other related changes/updates without written approval from the Owner. This shall include issues with vibration, noise and other related alarms and alerts.
7. Verify and document that all CNG systems and equipment receive complete operational checkout by installing contractors, vendors and manufacturers and provide all related documentation.
8. Verify, schedule and document all CNG equipment and system performance.
9. Verify and validate that the Owner's operating personnel are adequately trained on the operation and maintenance of building equipment and systems.
10. Verify, in writing, the completeness of Operations and Maintenance Data.
11. As part of the commissioning process, the GC shall perform a performance test that shall record the highest pressure of the buffers, video record – continuously – the PLC operational screen during these tests, record ambient temperature before and after the test, record buffer pressures prior to the start and after the completion, and record all measurements during this test. See Appendix A of this specification section for instruction and test recording form of the performance test.
12. The commissioning process does not reduce the responsibility of the Contractors or Vendors to perform and complete all Work in accordance with the requirements of the Contract Documents.
13. The contractor shall provide a list of all repair and maintenance items that have occurred and may occur.
14. The contractor shall provide complete commissioning checklists that are to include the new master PLC, all retrofitted/existing CNG equipment with Point I/O's and shall include points for verification of all terminations, IP addresses, etc.

15. Compliance with all entity having jurisdiction requirements including hiring 3rd party engineers to review all design and testing information and all North Las Vegas/Clark County special inspection requirements.
16. Provide all ANGI mater PLC Narratives, in writing, in compliance with the all requirements and identify and deviations from the Preconstruction or existing site narratives.
17. Provide a listing of all normal wear and tear on the CNG equipment and assure all related costs are included in the schedule of values and all related subcontractors contracts. The GC shall no claim for compensation for is failure to not include these costs in the schedule of values/all subcontracts.
18. Provide a breakdown of all shutdowns, hot work and related CNG fueling interruptions at both sites and include all costs for overtime, extra work, weekend, shift differential for this and all related work. The GC shall no claim for compensation for is failure to not include these costs in the schedule of value or in any subcontractor agreement.
19. Each of the two project site locations shall be commissioned independently, including site-specific documentation as required.
20. Commissioning of all CNG equipment and systems shall take place and be completed and accepted prior to the GC requesting and receiving Substantial Completion for this project.

B. Prerequisites. Commissioning will commence after:
   1. The CNG programming has been uploaded and operational, without issue for 20 consecutive calendar days. The GC demonstrate and submit the results of this verification to the Owner for review and acceptance.
   2. All new CNG and CNG related equipment has been installed and operated for 10 consecutive calendar days without issue – GC to provide documentation to support this operation.
   3. Preliminary punch list items are scheduled and completed by GC and submitted to the Owner for review.
   4. Equipment manufacturer's pre-start checklist has been completed for all CNG and submitted to the Owner for review.
   5. Upon completion of all programming, all CNG systems shall be tested for 10 consecutive calendar days with the new programming operating at each site – SMF and IBMF.

C. Sequence. The steps associated with commissioning of new or modified equipment under this project, are outlined below:
   1. Step One – Initial programming upload and testing/verification to accommodate for new and modified equipment.
   2. Step Two – Installation Verification.
   3. Step Three – Initial System Start-Up.
   4. Step Four – Initial Functional and Performance Testing.
   5. Step Five – Final programming and testing/verification, including debugging and program updates as needed, and including documentation.
   6. Step Six – Schedule all required field testing for demonstration of new and existing CNG systems and equipment for review and acceptance.
   7. Step Seven – Final Field Functional Performance testing of all new/existing CNG systems.
   8. Step Eight – Perform reliability test.
   9. Step Nine – Owner review and verification of all results.

10. Step Ten – Re-demonstration of all Field Functional Performance testing of all new/existing CNG systems.
11. Step Eleven – Owner Follow up and review

D. Training. Operational staff training is essential to the commission process and will run concurrently with steps one through nine.

E. Team. The Commissioning Team will include representatives of the Owner, Construction and Installing Contractors, Equipment Manufacturer, and Construction Contractor's Commissioning Agent - Trillium. Equipment manufacturer's representatives will be present for start-up as specified in the equipment specification sections and for equipment training.

1.4 SYSTEMS TO BE COMMISSIONED

A. Commissioning will be performed on the following new and modified systems and equipment:
1. New and relocated CNG compressor skids.
2. Modifications to all existing CNG equipment.
3. Relocated CNG compressor skid(s).
4. New and existing/ modified CNG programming operations.
5. New and existing/ modified interconnection details.
6. New and existing/ modified Motor-starter assemblies.
7. New and existing/ modified 'Matrix' valve panels.
8. New and existing/ modified PLC controllers.
9. New and existing/ modified CNG dispensers.
10. Previously installed emergency generators operating under final load including new transfer switches.
11. Gas site-supply regulators.
12. Mobile office structure at SMF.
13. Access-control system.
14. Video-surveillance system.
15. Gas detection system.
16. ESD system including home-run and addressable functionality.
17. Fire alarm system.
18. Complete integrated CNG system at IBMF.
19. Complete integrated CNG system at SMF.

B. Commissioning of each system listed in paragraph 1.4.A shall be documented by the Contractor and approved by the Owner.

1.5 SUBMITTALS

A. Submit under provisions of Division 43 Section and Division 01 Section "General Requirements."

B. Commissioning Plan and all commissioning activities must be executed/completed and accepted by the Owner prior to Substantial Completion.

C. List of all consumable materials that the GC is responsible to provide and install at no

cost to the Owner, up to Final Acceptance.

D. Commissioning Plan as prepared by the Contractor or his Commissioning Agent. A plan shall be provided specific to each facility site and each plan shall include:
   1. Schedule
   2. Programming narrative
   3. Fault Logs for the previous 30 calendar days CNG equipment
   4. Shop/As built drawings – submitted and with approval
   5. Specific equipment factory test data
   6. Equipment & system checklist

E. Contractor or his Commissioning Agent shall provide Functional Performance Tests (FPT) procedures for the above listed systems. Contractor or his Commissioning Agent shall provide system narrative descriptions as part of the FPT procedures.

1.6 DEFINITIONS

A. Acceptable Performance: That level of performance, by equipment and systems, that meets the standards as defined by the equipment/system's manufacturer and the construction contract documents. "Acceptable Performance" is confirmed through Pre-functional and Functional Performance testing.

B. Commissioning (Contractor): The process of testing, verification and documentation to demonstrate to the Owner and Contractor that systems and equipment function properly, both individually and as a system, in order to meet the facilities operating requirements.

C. Commissioning Authority (Contractor): The Owner's representative during commissioning, provides Quality Assurance of the Contractor's Commissioning efforts, and is the Owner's systems and equipment technical representative. The Contractor does not have authority to authorize modifications to the requirements of the Contract Documents.

D. Commissioning Issues Log (Master Deficiency and Resolution Log): A Contractor-maintained sequential listing of all issues brought to light during the commissioning process briefly describing each issue and its eventual disposition, dated and with indication of the party who has assumed responsibility for resolution. The form is provided by the Contractor, distributed in MS Excel format to all commissioning team members at regular intervals, and reviewed at commissioning meetings to facilitate tracking and resolution of Contractor issues.

E. Commissioning Plan: A document prepared/submitted by the Contractor, which defines all tasks and responsibilities throughout the commissioning process, including pre-functional, functional, and performance period testing. It outlines specific tests for the Contractor to perform, and the means of documenting the outcome of those tests. Documentation is done primarily though the completion of checklists, in order to test and document system and equipment performance in accordance with the technical specifications and the equipment manufacturers field quality control requirements. The process integrates training, as defined in Division 43, into the Contractor's requirements for functional and performance testing. The Contractor with relevant input from Contractor's team members develops the Contractor's plan.

F. Commissioning Process: The process of demonstrating to the Owner that systems are installed, functionally tested and capable of being operated and maintained to perform in conformity with the construction documents and manufacturer's standards. The commissioning process encompasses and coordinates the traditionally separate functions of equipment start-up, control system calibration, testing adjusting and balancing, performance testing, acceptance, system documentation and training.

G. Commissioning Status Report / Schedule Form: A Table listing all equipment to be commissioned grouped by system, with fields corresponding to each commissioning stage, form and/or milestone. The fields may be filled with either a percentage indicating progress, or a date indicating a work plan. Remarks are referenced as required.

H. Final Commissioning Test Documentation: The compilation of all documents generated throughout the Commissioning process, to include: Completed and signed Pre-functional Tests, organized by system; completed and signed Functional Tests, organized by system; completed and signed Performance Period Testing reports, organized by system; Final Commissioning Issues Log; TAB reports; Commissioning meeting minutes.

I. Functional Performance Testing (FPT): The dynamic testing of systems (rather than just components) under full operation (e.g., the Air Handler is tested interactively with the heating hot water system functions to see if the pump ramps up and down to maintain the differential pressure set point, the heat exchangers are controlled properly to produce hot water at set point, and room comfort set points are maintained without excessive energy waste as loads vary). The plan for this testing developed by the Contractor and executed by the Contractor. The Contractor performs Quality Assurance of the execution of the FPT.

J. Functional Performance Testing Plan (FPTP) and Forms: These are components of the Contractor Plan, and include the specific functional performance test procedures, checklists and documentation, in a sequential written form, developed by the ContractorA, to be executed by the Contractor.

K. OEM: Original Equipment Manufacturer or equipment vendor or supplier of equipment.

L. Pre-Functional Test Plan (PFTP): This is a component of the Contractor Plan and covers all Pre-functional testing. It is prepared jointly by the Owner/Contractor, and executed by the Contractor. The Pre-Functional Test Plan includes all Pre-functional checklists, which consists primarily of "static" checks and tests, designed to ensure the equipment to be commissioned has been installed properly, and is ready for Functional Performance Testing.

M. Pre-Functional Tests and Checklists: Pre-functional Checklists are used to document and certify verification of completion of the steps necessary prior to Functional Performance Testing, such as installation, cleaning, start up, TAB, etc.

N. Simulated Condition: Condition that is created for testing the response of a system (e.g., applying a hair dryer to a space temperature sensor to see the response in a reheat coil valve).

O. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

P. "Scope Gap" which means contract work performed by the Contractor or Subcontractor that shall not allow for additional charges to contract, charges to contingency and other charges. Scope Gap shall exclude differences in scope between the contractor and any subcontractor/supplier contract/invoice or agreement, shall exclude charges for any demolition, shall exclude premium labor rates – including overtime, weekend work, shift differential, hot work, holiday work. It shall exclude any interferences or obstructions, shall exclude site grading, paving, landscaping and shall exclude all CNG related service, hardware and software. The Contractor shall be responsible to inform all subcontractors and suppliers that all base contract requirements “flow down” through all contracts, agreements and invoices

Q. Startup: The initial starting or activating of dynamic equipment including executing pre-functional checklist items. Refers to the equipment manufacturer’s field quality control process and procedures required to activate equipment.

R. System(s): Group of components and equipment functioning as a unit or performing a common function. (i.e. Chilled Water System: consisting of pumps piping, coils, valves, fittings, controls, expansion tanks, air relief, chemical treatment, etc.).

S. System Components: Equipment that act/operate “individually” but are essential to the operation of a System. System Components for HVAC, for example, would include fans with motors, compressors, chillers, VAV boxes, dampers and pumps. For the purposes of this Section, “conveyance” mediums, such as ducts and pipes, are not considered System Components.

T. Test Equipment Calibration Certifications: Reports of traceable calibration of test equipment to NIST standards by certified agencies or equivalent.

U. Test Procedures: The step-by-step process, which must be executed to test the performance of a given set of functions and/or operational modes.

V. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents.

PART 2 - PRODUCTS

2.1 COMMISSIONING PLAN

A. The GC shall provide a detailed commissioning plan which shall outline the organization, scheduling, team members, and documentation pertaining to the overall commissioning process, testing, operating parameters and expected final results.

B. The final results shall include time of day, daily temperatures, operating parameters, compression outputs, fueling parameters, actual fuel times and dispensing time frames on a GGE per minute basis at both for each site as a whole system (variations in dispenser flow rate of less than 5% are acceptable).

2.2 NARRATIVE DESCRIPTIONS

A. A summary narrative description of the design intents of the systems and their intended modes of sequences of operation.

2.3 FUNCTIONAL PERFORMANCE TESTS (FPT) PROCEDURES

A. The FPT procedures at the minimum shall consist of the following sections:
   1. Narrative Description:
      a. This section provides a narrative description of the design intents of the systems and their intended modes of sequences of operation.
   2. Testing Prerequisites:
      a. This section contains verification that primary mechanical, electrical, and controls systems that support or interact with the system that the FPT is prepared against are completed, tested and operational.
   3. Installation Verification:
      a. This section contains verification that the system installation is completed and is ready for commissioning.
   4. Commencement of Functional Performance Testing:
      a. This section records the date and time of the start of system commissioning.
   5. System Condition Prior to Staring Performance Testing:
      a. This section records the current set points and parameters of the system at the start of commissioning.
   6. Functional Performance Test:
      a. This section shall provide the following:
         1) Sequential steps required to set parameters and conditions required to test component and functions throughout intended ranges of operation.
         2) Full range of checks and tests carried out to determine if electric and pneumatic connections, components, subsystems, systems and interfaces between systems function in accordance with the contract documents and design intents.
         3) All modes and sequences of control operations, interlocks and conditional control responses and specified responses to abnormal emergency conditions.
   7. End of Functional Performance Test:
      a. This section records the date and time of the end of system commissioning.
   8. Field Notes:
      a. This section records notes or remarks during system commissioning.
   9. List systems modifications, not required by the Contract Documents, but provided by the Contractor. List other questions regarding such system modifications.
   10. List problems discovered during commissioning that were corrected.
   11. List problems discovered during commissioning that were not corrected.
   12. List recommended party that should take action on these problems.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for performing procedures presented in specification and contract drawings as detailed in the Functional Performance Tests (FPT). Members of the designated Commissioning Team shall witness various

portions of the commissioning process. Responsibilities for these activities are listed in the following paragraphs. Commissioning Team members shall sign-off on appropriate sections after verifying installation, operation, or documentation. Final sign-off shall be by the Owner and Commissioning Agent.

B. Any test ports, gauges, test equipment, etc., needed to accomplish the functional performance tests shall be provided by Contractor.

C. Contractor shall provide to the Commissioning Team documentation of calibration of controls. Documentation shall include dates, setpoints, calibration coefficients, control loop verification, and other data required to verify system check-out. Documentation shall be dated and initialed by field engineer or technician performing the work.

3.2 OPERATIONAL STAFF TRAINING

A. System narrative descriptions will be prepared by the Commissioning Team and supported by flow diagrams, one line diagrams, and appropriate specification sections for major systems to be commissioned. The Commissioning Team will coordinate “system description” meetings with members of facility management and maintenance department groups to review system description documentation. The meetings will provide an overview of major system features, components, and arrangements.

B. The Contractor and associated manufacturer’s representatives shall provide required training to operational staff after the system description meetings have occurred. The Contractor training sessions shall provide a more detailed analogy of systems operation and maintenance.

3.3 INSTRUMENTATION

A. Test Instrumentation. Instrumentation will be provided by the Contractor. Instruments used for measurements shall be accurate. Calibration histories for each instrument shall be available for examination. Calibration and maintenance of instruments shall be in accordance with the requirements of NIST or other bodies as agreed between the Owner and Contractor.

3.4 DOCUMENTATION

A. The installing Contractor shall be responsible for collection of pertinent data during system start-up and functional performance testing. The Contractor shall submit to the Commissioning Agent documentation of tests performed prior to and after system start-up. Documentation shall also include start-up procedures as approved by Commissioning Team.

B. Documentation is to be electronically type written on 8-1/2 by 11 inches paper and published as a bound and text-searchable PDF. Indicate the project name, number, volume number, and volume title on the end panel of each binder.

C. Provide a title sheet for each volume and list the following:
   1. Volume Title and Section Name and Number requiring this submittal.
   2. Project name, project number, and address.
   3. Contractor name, address, and phone number.

4. Name, title, signature, and date of person making the submittal.
5. Name of Owner, a blank line for signature, and the date of person accepting the submittal.
6. Name, address, and phone number of Commission Agent; a blank line for signature; and date of person accepting the submittal.

D. Provide a Table of Contents for multiple submittals. List each submittal and page number. Number each page, centered on the bottom in sequential numerical order. Provide tabs for multiple submittals in a single binder.

3.5 STEP ONE - INSTALLATION VERIFICATION

A. General Commissioning responsibilities:
   1. Before system start-up begins, the Commission Team shall conduct a final installation verification audit. The Contractor shall be responsible for completion of work including change orders and punch list items to the Owner's satisfaction. The audit shall include, but not be limited to, checking of:
      a. Piping specialties including balance, control, and isolation valves.
      b. Ductwork specialty items including turning devices, balance, fire, smoke, control dampers, and access doors.
      c. Control sensor types and location.
      d. Identification of piping, valves, equipment, controls, etc.
      e. Major equipment, pumps, valves, starters, gauges, thermometers, etc.
      f. Documentation of prestart-up tests performed, including manufacturer's factory tests.
   2. If work is found to be incomplete, incorrect, or non-functional, the Contractor shall correct the deficiency before system start-up work proceeds.

3.6 STEP TWO - SYSTEM START-UP

A. General Commissioning Responsibilities:
   1. A start-up plan shall be developed and submitted by the installing Contractor for all new and modified equipment, piping and systems. Start-up plan to include the following:
      a. Flushing and cleaning of pipe.
      b. Filters, strainers, and screens.
      c. Valve positions.
      d. Electrical tests.
      e. Pressure tests.
      f. Safeties.
      g. Manufacturer's checklists.
      h. Manufacturer's tests.
   2. The start-up plan will be reviewed and a prestart-up inspection performed by designated members of the Commissioning Team. The installing Contractor shall commence with system start-up after approval has been given to start-up plan and the prestart-up inspection is completed. Designated members of the Commissioning Team shall witness system start-up and list system and equipment deficiencies noted during start-up. The Contractor shall take corrective action on system deficiencies noted and demonstrate to the Commissioning Team member's suitable system operation.

3. Designated systems requiring test and balance work shall have this activity commence after systems have successfully completed start-up. System and equipment deficiencies observed during this activity is to be noted and corrected.

3.7 STEP THREE - FUNCTIONAL PERFORMANCE TESTING

A. General Commissioning Responsibilities:
   1. Functional Performance Testing begins after operational testing, adjusting, and balancing of the systems have been completed by the Contractor; and the System Description and Hands-on Training sessions have been completed.
   2. The objective of the Functional Performance Testing is to advance the building systems from a state of substantial completion to full dynamic operation in accordance with the specified design requirements and design intent.
   3. Attaining this object will be accomplished by developing individual systems testing protocols which, when implemented by the Contractor, will allow the Commissioning Team to observe, evaluate, identify deficiencies, recommend modifications, tune, and document the systems and systems equipment performance over a range of load and functional levels.
   4. Functional Performance tests for the systems to be commissioned are defined in the Commissioning Plan. These tests are intended to be conclusive but may require minor modifications as system operation dictates.

PART 4 - APPENDIX

See following page for Appendix A.

APPENDIX A

Performance Test Recording Form

CNG-Fueling Facility • Capacity-Rate Test • Data Collection Form

Owner: RTC • Facility: _____ • Test Date: _____

Lane #: _____			Log Stopwatch Time Event (continuous time, starting at		**Fill Mass Dispensed GGEs (or as**	End-Fill Bus PSI (measure on bus gauge)
Cycle #	Bus ID #	Pre-Fill Bus PSI (measure on bus)	Start Fill	Complete Fill		
1			0:00			
2						
3						
4						
5 (optional)						
6 (optional)						
Total GGEs	–	–	–			–

Data logged by (name & organization):

Test Procedure

1. Verify all required compressors are online, and document (dynamic) skid-suction pressure. Including at least one added suction-pressure reading during test.
2. Pre-test: A) Queue 4-6 buses per lane; B) Verify each bus has max. 2000 PSI onboard-storage pressure; C) Print & provide a Data Collection Form for each lane; D) Review test procedure with each data logger, particularly stopwatch procedure (note #'s 6-8 below); E) Verify that all required compressors/pumps are on, running and in recirculation or in standby mode, and buffer is full and online.
3. Connect dispenser nozzles at all buses, and authorize fuel-management system, but do not start fueling yet.
4. Simultaneously: A) Leader shouts 'Start!'; B) All lanes start stopwatches; C) Start fueling at each disp'r. D) All stopwatches should read same time +/- 2 seconds *throughout the test*.
5. Fuel buses until each dispenser auto-completes, and limit exchange (time between nose connections) at each dispenser to 120 seconds as practical.
6. DO NOT reset stopwatch – simply log the running time for each 'event'. Each event will have a (cumulative) time log greater that its predecessor. **(Example,** first bus in a lane finishes at 6:20, second bus in that lane starts at 8:18 seconds and finishes at 14:40 seconds, etc.,
7. Log and complete one Data Collection Form for each dispenser/lane used in test. Keep one test form per lane, and observer should verify each data entry.
8. Note stopwatch time when last bus completes its fill, as this will mark the end time for the test. 16th bus may be on any lane. Do Not fuel other (non-test) buses until the final test bus has completed filling.
9. Verify and log the 'Additional Test Data' on Calculations sheet of the test form, with compressors loaded.
10. 'Calculations' form to be approved and signed by agents from Owner, Contractor, and Consultant.

Fuel Solutions, Inc. CNG-Fueling Facility • Dispense-Test Data Form rev 091214

END OF SECTION 019113

SECTION 02 06 00

AGGREGATE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate materials for fill, drainage, and grading purposes.

1.2 REFERENCES

A. AASHTO M147 - Materials for Aggregate and Soil-Aggregate.

B. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

C. ASTM C 136 - Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM D 1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

E. ASTM D 2487 - Classification of Soils for Engineering Purposes.

F. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D 4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

A. Samples: Submit, in air-tight containers, 2-pound sample of each type of aggregate to testing laboratory.

B. Materials Source: Submit name of imported materials suppliers.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, Clark County Area, Nevada, latest edition and Clark County Public Works Supplements and all related jurisdictional requirements.

B. Maintain one copy on site.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Aggregate Base Courses Type 1 and Type II: Conforming to Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, Clark County Area, Nevada, latest edition and Clark County Public Works Supplements and all related jurisdictional requirements.

B. Aggregate for Bituminous Courses: Conforming to Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, Clark County Area, Nevada, latest edition and Clark County Public Works Supplements and all related jurisdictional requirements.

C. Gravel Mulch (Decomposed Granite): Coarse Stone: washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C 136; within the following limits:

Sieve Size	Percent Passing
3 inches	100
2 inches	90 to100
1.5 inch	70 to 100
3/4-inch	0 to 50
3/8-inch	0 to 10
No. 8	0 to 5
No. 200	0 to 3

D. Aggregate for Portland Cement Products: Conforming to Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, Clark County Area, Nevada, latest edition and Clark County Public Works Supplements and all related jurisdictional requirements.

2.2 SOURCE QUALITY CONTROL

A. Aggregate Material - Testing and Analysis: Perform in accordance with Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, Clark County Area, Nevada, latest edition and Clark County Public Works Supplements and all related jurisdictional requirements .

B. If tests indicate materials do not meet specified requirements, change material or material source and retest.

C. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations designated by Owner.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

E. Materials shall be stockpiled on impervious material and covered over with same material, until disposed of.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 020600

SECTION 02 23 00

SITE CLEARING- LEVELING/DEMOLITION/SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris; removal of large rocks, debris, any plant life, and topsoil excavation.
B. Removal and demolition of all concrete pads, bases, footings, and all related concrete appurtenances, removals and excavation.
C. Removal and demolition of all electrical conduit, pads, supports, and all related electrical appurtenances.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT PER GMP

A. Site Clearing/CNG Fueling Area Leveling: Measured by the square yard. Separate payment. Payment is included in the GMP and failure to include these costs will not relieve the contractor of his responsibility to perform this work at no cost to the owner.
B. The Contractor will perform subsurface utility exploration will develop/submit a Utility Designation Plan, which includes all existing footings/conduit conflict schedule for the Owner's review. The Contactor shall identify any/all UG conflicts and shall be responsible for any such issues that appear during construction.
C. The Contractor shall also perform all required detailed site surveys including topographical surveys of the existing footing, curb and all elevations as identified in the design documents to assist in the completion of the proposed area concrete installation, drainage and shall perform all surveys that assist in the design process. Contractor shall be responsible for any/all missing, omitted information that leads to construction field issues, changes or requests for compensation.
D. The removal and demolition of all concrete pads that are to be identified by the Contractor shall be identified and included in the schedule of values. Failure to identify all concrete demolition will not relieve the contractor of the costs and schedule impact to perform this work. The Contractor shall have no remedy for the failure to identify this work.
E. The removal and demolition of all electrical pads that are to be identified by the Contractor shall be identified and included in the schedule of values. Failure to identify all concrete demolition will not relieve the contractor of the costs and schedule impact to perform this work. The Contractor shall have no remedy for the failure to identify this work.
F. The Contractor shall include all site grading and leveling as part of this schedule of values at both sites and shall include all related costs in the schedule of values.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that existing elevations are identified and provide all site markings required.

B. Identify a waste area for placing removed materials.

3.2 PROTECTION

A. Locate, identify, and protect utilities that remain, from damage.

B. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove all excess dirt, concrete, electrical equipment from the site.

3.4 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

3.5 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Material shall be stockpiled on impervious material on 36 mil Hypalon material and covered over with the same material, until disposal.

C. Remove excess topsoil not intended for reuse, from site.

END OF SECTION 02 23 00

SECTION 02 31 50

EXCAVATION AND FILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavating for areas within the CNG Fueling areas, roads, parking areas, and site grading; paving and landscaping and excavating for foundations and site structures.

1.2 SUBMITTALS

A. Samples: Submit, in air-tight container, 2 pound sample of each type of fill to testing laboratory, as directed by the Owner.

B. Materials Source: Submit name of imported materials source

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours and datum locations.

B. Locate, identify and protect utilities that remain from damage.

C. Notify utility company to remove and relocate utilities.

D. Protect plant life, lawns, rock outcroppings and other features remaining as a portion of final landscaping. Repair and match landscaping finish materials, including decorative rock and gravel, after completion of utility trenching and backfill.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, parking lots, bumpers and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATING

A. Underpin adjacent structures which may be damaged during excavating work.

B. Excavate subsoil to accommodate building foundations, slabs on grade, paving, parking lots, site structures and construction operations.

C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity.

D. Slope banks with machine to angle of repose or less until shored.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Grade top perimeter of excavating to prevent surface water from draining into excavation.

G. Hand trim excavation; Remove loose matter.

H. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard measured by volume from site.

I. Notify Owner of any unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.

J. Correct areas over excavated with backfill and compact replacement as specified for authorized excavation or replace with fill concrete as directed.

K. Stockpile excavated material in area designated on site in accordance with Sections 02 06 00 and 02 23 00; remove excess or unsuitable material from site.

L. Provide steel roadway plates of sufficient strength in the parking lot area of excavation to assure traffic flow is not interrupted.

3.3 FIELD QUALITY CONTROL

A. Provide visual inspection of bearing surfaces.

B. Perform work in accordance with Uniform Standards Specifications for Public Works' Construction Off-Site Improvements and all related jurisdictional requirements.

3.4 PROTECTION

A. Prevent displacement of loose soils from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement. lateral movement, undermining, washout and other hazards created by earth operations.

END OF SECTION 02 31 50

SECTION 02 32 00

BACKFILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site filling and backfilling, fill under slabs on grade, fill under paving, fill under sidewalks, and fill under parking lots consolidation and compaction as scheduled.

1.2 REFERENCES

A. AASHTO T180 – Moisture-Density Relations of Soils using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASTM D 1556 – Density of Soil in Place by the Sand Cone Method

C. ASTM D 1557 – Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 10 pound (4.54 kg) Rammer and 18-in. (457 mm) Drop.

D. ASTM D 2922 – Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D 3017 – Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D 4253 – Maximum Index Density AND Unit Weight of Soils Using a Vibratory Table.

1.3 SUBMITTALS

A. Samples: Submit, in air-tight container, 2 pound sample of each type of fill to testing laboratory, as directed by the Owner.

B. Materials Source: Submit name of imported materials source

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Aggregate Base Courses Type 1 and Type II – As specified in Section 02060.

B. Structural Fill: Conforming to Uniform Standard Specifications for Public Works' Construction Off-Site Improvements and all related jurisdictional requirements.

C. Concrete: Lean concrete conforming to Section 033000 with compressive strength of 150 pounds per square inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Very subdrainage, damproofing or weatherproofing installation has been inspected.

B. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cutout soft areas of subgrade not capable of compaction in place. Backfill with Aggregate Base Course Type II fill and compact to density equal to or greater than requirements for subsequent fill materials.

C. Scarify and proof roll subgrade surface to a depth 8 inches to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill materials.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow for maximum time for natural settlement. Do not backfill porous, wet, frozen, spongy subgrade surfaces.

C. Place and compact backfill materials to Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, and conformance with all related jurisdiction requirements.

D. Employ a placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until support are in place.

H. Make gradual grade changes. Blend slope into level areas.

I. Remove surplus backfill materials from site.

J. Leave fill material stockpile areas free from excess fill materials.

3.4 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

B. Top Surface and General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be in accordance with ASTM D 1557.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest.

C. Frequency of Tests: In accordance and conforming to Uniform Standard Specifications for Public Works' Construction Off-Site Improvements and all related jurisdictional requirements.

3.6 PROTECTION OF UNFINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic.

B. Provide required metal traffic plates to protect this work.

END OF SECTION 02 32 00

SECTION 02 32 40

TRENCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavating trenches for utilities from 5 feet outside building to municipal utilities; compacted fill from top of utility bedding to subgrade elevations; and backfilling and compaction.

1.2 RELATED SECTIONS

A. Section 02 06 00 - Aggregate.

B. Section 02 31 50 - Excavation and Fill.

C. Section 02 32 00 – Backfill.

D. Section 03 30 00 - Cast-in-Place Concrete: Concrete materials.

E. Section 28 05 28 - Raceway and Boxes.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ASTM D 1556 - Density of Soil in Place by the Sand-Cone Method.

C. ASTM D 1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 SUBMITTALS

A. Submit details of sheeting and bracing proposed for use to A/E for review prior to the start of any trenching.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.
B. Utilize all existing Geotech reports and assure compliance with all code requirements.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Approved Fill Material: As specified in and in accordance with the Uniform Design and Construction Standards for Potable Water Systems and Design and Construction Standards for Waste Water Collection Systems, latest editions.

B. Structural Fill: As specified bore hole locations, findings of subsurface materials and recommendations.

C. Concrete: Structural concrete conforming to Section 033000.

PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Grades:
1. Lay pipes true to lines and grades indicated.
2. Maintain grade alignment of pipe by use of string line parallel with grade line and vertically above centerline of pipe. Establish line on level batter boards at intervals of not more than 25 feet. Batter boards shall span trench and be rigidly anchored to substantial posts driven into ground on each side of trench. Set three adjacent batter boards before laying pipe to provide check on grades and line. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route. Pipe shall not be laid using side lines for line or grade.
3. As alternative means of establishing alignment and grade, utilize "Laser-Beam" instrument with competent operator.

B. Location of Conduits:
1. Location and approximate depths of proposed conduits shall be as shown on Drawings.
2. Owner reserves right to make changes in lines, grades, and depths of conduits and manholes.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities which are to remain.

E. Cut out soft areas of subgrade not capable of compaction in place. Backfill with approved material and compact to density equal to or greater than requirements for subsequent backfill material.

3.3 EXCAVATING

A. Excavate subsoil required for utilities to municipal utilities.

B. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

C. Do not interfere with 45-degree bearing splay of foundations.

D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3-cubic yard, measured by volume.

F. Correct areas over excavated areas with backfill and compact replacement as specified for authorized excavation or replace with fill concrete as directed.

G. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.4 TRENCHING

A. Excavations:
   1. Excavate so that conduit can be laid and jointed properly. Make trench so that conduit can be laid to alignment and depth as shown on Drawings; excavate only so far in advance of conduit laying as permitted by Owner. Excavation shall not be more than 2 feet wider at bottom than outside diameter of pipe or structure. If there is no interference with construction or adjacent property, and if soil permits, side walls of excavation may be sloped starting at a point 2 feet above top of conduit.
   2. Excavate trench to depth required to provide uniform and continuous bearing and support for conduit on bedding material at every point between joints, except where conduit slings or other lifting tackle are withdrawn.
   3. Excavation Below Grade:

a. Where excavation indicates that the subsurface materials at the bottom of the trench are in a loose or soft state, the Contractor shall be advised to excavate to a depth where suitable material is encountered, as directed by the Owner.
b. Where the bottom of the trench has been excavated by mistake to a greater depth than required, the Contractor shall refill this area using approved material. No additional compensation shall be given to the Contractor. Refilling with earth to bring the bottom of the trench to the proper grade will not be permitted.

4. Excavation within 24 inches of existing utilities shall be governed by the respective utility.

B. Trenching in Advance of Conduit Laying: Trench for conduit lines shall not be opened for distance of more than 200 feet at any one time, unless authorized by Owner. At no time will more than 50 feet of trench be left open at end of a working day. Provide protection of open trench, as reviewed by Owner.

3.5 SHEETING AND BRACING

A. General:
1. Sheeting and bracing of excavations shall conform to latest statutes of State of Nevada governing safety of workers in construction industry. When necessary, install sheeting and bracing to prevent ground movement that may cause damage or settlement to adjacent structures, pipelines, and utilities. Repair damage due to settlement because of failure to use sheeting or because of inadequate bracing, or through negligence or fault in any other manner.
2. Shore, sheet, brace, or slope sides of trenches in unsuitable, loose, or soft material, 5 feet or more in depth, or otherwise support by means of sufficient strength to protect employees working within.

B. Sheeting Requirements:
1. Where excavations are made with vertical sides which require supporting, sheeting and bracing shall be of sufficient strength to sustain sides of excavations and shall prevent movement which could in any way injure Workers or adjacent structures, or diminish working space sufficiently to delay Work. Take precautions where there is additional pressure due to presence of other structures.
2. Select sheeting and bracing of sufficient dimensions and strength to adequately support sides of trenches and excavations. Submit details of sheeting and bracing proposed for use to Owner for review.
3. Timber sheeting shall conform in quality to select structural Douglas Fir lumber and shall be sound, live timber, free from sap, large checks, shakes, loose or decayed knots, worm holes, and other imperfections which may impair its strength or durability.
4. In wet excavation, use grooved sheeting to prevent passage of soil. Fill voids between sheeting and face of excavation with suitable material rammed in place.
5. Remove sheeting and bracing before completion of Work, unless otherwise directed in writing by Owner. Cut off sheeting which is left in

place 18 inches below original ground surface or as directed by Owner. Untreated wood will not be allowed to be left in place.

3.6 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Approved Fill Material: Place and compact material in equal continuous layers not exceeding 8-inches compacted depth.

D. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Remove surplus fill materials from site.

G. Leave fill material stockpile areas completely free of excess fill materials.

3.7 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.08-foot from required elevations.

B. Top Surface of General Backfilling: Plus or minus 0.08-foot from required elevations.

3.8 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D 1556, ASTM D 1557, AASHTO T180, ASTM D 2922, and ASTM D 3017.

B. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

C. Frequency of Tests: As specified in and in accordance with the Uniform Design and Construction Standards for Potable Water Systems and Design and Construction Standards for Waste Water Collection Systems, latest editions.

3.9 PROTECTION OF FINISHED WORK

A. Reshape and recompact fills subjected to vehicular traffic during construction.

3.10 SCHEDULE

A. Duct Bank: Cover duct and bedding with approved fill material, to subgrade elevation, compacted to 95 percent.

END OF SECTION 02 32 40

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other related Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. CMU wall footings
5. Steel security fence footings
6. Concrete toppings and sealants.
7. Building frame members.
8. Building walls.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 BUY AMERICA COMPLIANCE

A. The contractor shall comply with the applicable Buy America requirements set forth in 49 U.S.C 5323(j) and the applicable regulations in 49 C.F.R Part 661, as amended. If the contractor procures any capital items with Federal Funds, it is the Contractor’s responsibility to obtain the Buy America certification required under such regulations

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

E. Samples: For waterstops vapor retarder.

F. Welding certificates.

G. Qualification Data: For Installer manufacturer testing agency.

H. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

I. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

J. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

K. Field quality-control test and inspection reports.

L. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.