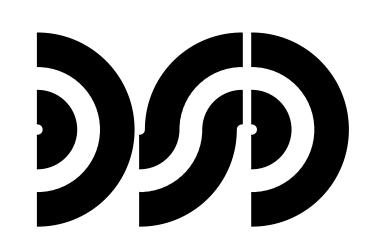
CITY OF ANN ARBOR

LARCOM CHILLER REPLACEMENT PROJECT

301 E. HURON STREET
ANN ARBOR, MICHIGAN 48104



DICLEMENTE SIEGEL DESIGN INC.

28105 GREENFIELD ROAD
SOUTHFIELD, MICHIGAN 48076-3046
DSD PROJECT No. 18-1304

ENGINEERING AND ARCHITECTURE

ARCHITECTURAL SHEET INDEX

SHEET DESCRIPTION

A-001 ARCHITECTURAL GENERAL INFORMATION
A-101 ARCHITECTURAL PENTHOUSE PLAN & DETAILS

MECHANICAL SHEET INDEX

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 M-2 PENTHOUSE FLOOR & ROOF DEMOLITION PLANS
 M-3 PENTHOUSE FLOOR & ROOF NEW WORK PLANS
 M-4 CHW CONTROL SEQUENCE

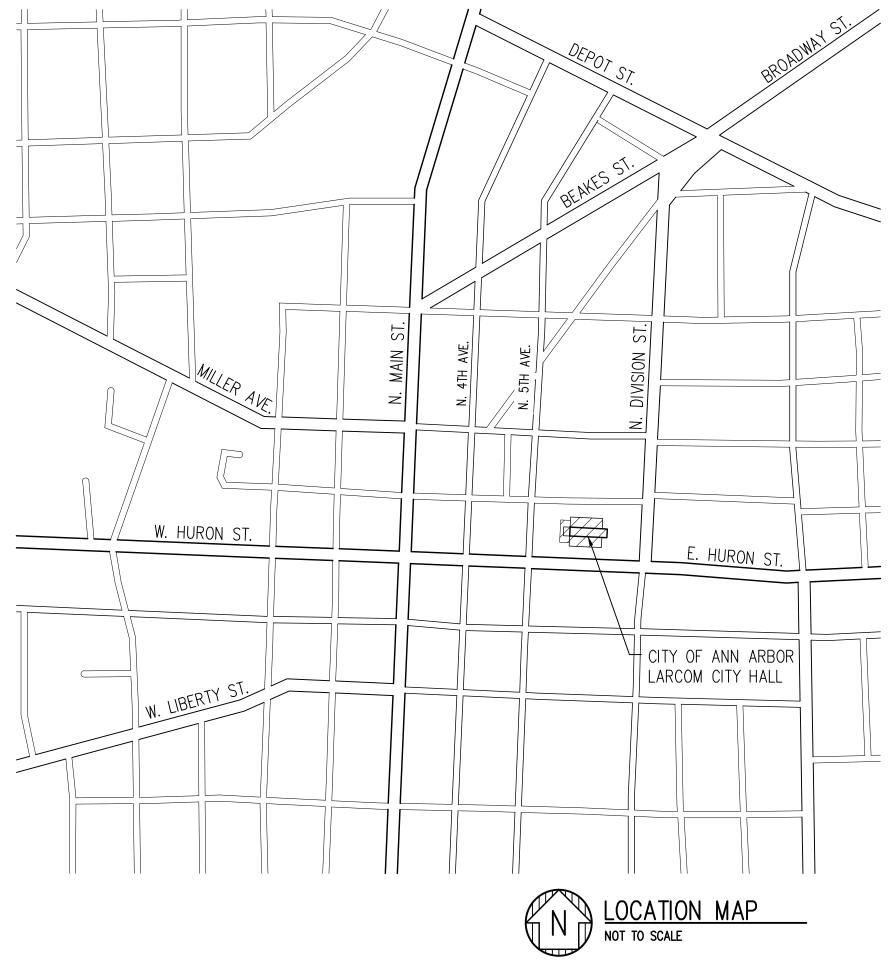
M-5 HW CONTROL SEQUENCE

ELECTRICAL SHEET INDEX

SHEET DESCRIPTION

E-1 GENERAL ELECTRICAL INFORMATION

E-2 ELECTRICAL PENTHOUSE & ROOF DEMOLITION PLANS
E-3 ELECTRICAL PENTHOUSE FLOOR & ROOF NEW WORK PLANS
E-4 ELECTRICAL DEMOLITION AND NEW WORK ONE—LINE DIAGRAM







SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES:
- DEMOLITION AND REMOVAL OF SELECTED PORTIONS OF BUILDING OR STRUCTURE.
- 2. DEMOLITION AND REMOVAL OF SELECTED SITE ELEMENTS.
- SALVAGE OF EXISTING ITEMS TO BE REUSED OR RECYCLED.

1.2 DEFINITIONS

- A. REMOVE: DETACH ITEMS FROM EXISTING CONSTRUCTION AND LEGALLY DISPOSE OF THEM OFF-SITE UNLESS INDICATED TO BE REMOVED AND SALVAGED OR REMOVED AND REINSTALLED.
- B. REMOVE AND SALVAGE: CAREFULLY DETACH FROM EXISTING CONSTRUCTION, IN A MANNER TO PREVENT DAMAGE, AND DELIVER TO
- C. REMOVE AND REINSTALL: DETACH ITEMS FROM EXISTING CONSTRUCTION, PREPARE FOR REUSE, AND REINSTALL WHERE INDICATED.
- D. EXISTING TO REMAIN: EXISTING ITEMS OF CONSTRUCTION THAT ARE NOT TO BE PERMANENTLY REMOVED AND THAT ARE NOT OTHERWISE INDICATED TO BE REMOVED, REMOVED AND SALVAGED, OR REMOVED AND REINSTALLED.
- 1.3 PREINSTALLATION MEETINGS
- A. PREDEMOLITION CONFERENCE: CONDUCT CONFERENCE AT LARCOM CITY HALL, ANN ARBOR, MICHIGAN.
- 1.4 FIELD CONDITIONS
- A. OWNER WILL OCCUPY PORTIONS OF BUILDING IMMEDIATELY ADJACENT TO SELECTIVE DEMOLITION AREA. CONDUCT SELECTIVE DEMOLITION SO OWNER'S OPERATIONS WILL NOT BE DISRUPTED.
- CONDITIONS EXISTING AT TIME OF INSPECTION FOR BIDDING PURPOSE WILL BE MAINTAINED BY OWNER AS FAR AS PRACTICAL.

 NOTIFY ARCHITECT OF DISCREPANCIES BETWEEN EXISTING CONDITIONS AND DRAWINGS BEFORE PROCEEDING WITH SELECTIVE DEMOLITION.
- C. HAZARDOUS MATERIALS: IT IS NOT EXPECTED THAT HAZARDOUS MATERIALS WILL BE ENCOUNTERED IN THE WORK.
- HAZARDOUS MATERIALS WILL BE REMOVED BY OWNER BEFORE START OF THE WORK.
- 2. IF SUSPECTED HAZARDOUS MATERIALS ARE ENCOUNTERED, DO NOT DISTURB; IMMEDIATELY NOTIFY ARCHITECT AND OWNER. HAZARDOUS MATERIALS WILL BE REMOVED BY OWNER UNDER A SEPARATE CONTRACT.
- D. STORAGE OR SALE OF REMOVED ITEMS OR MATERIALS ON-SITE IS NOT
- E. UTILITY SERVICE: MAINTAIN EXISTING UTILITIES INDICATED TO REMAIN IN SERVICE AND PROTECT THEM AGAINST DAMAGE DURING SELECTIVE DEMOLITION OPERATIONS.

1.5 WARRANTY

A. EXISTING WARRANTIES: REMOVE, REPLACE, PATCH, AND REPAIR MATERIALS AND SURFACES CUT OR DAMAGED DURING SELECTIVE DEMOLITION, BY METHODS AND WITH MATERIALS SO AS NOT TO VOID EXISTING WARRANTIES.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

- A. REGULATORY REQUIREMENTS: COMPLY WITH GOVERNING EPA NOTIFICATION REGULATIONS BEFORE BEGINNING SELECTIVE DEMOLITION. COMPLY WITH HAULING AND DISPOSAL REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
- B. STANDARDS: COMPLY WITH ANSI/ASSE A10.6 AND NFPA 241.

PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. VERIFY THAT UTILITIES HAVE BEEN DISCONNECTED AND CAPPED BEFORE STARTING SELECTIVE DEMOLITION OPERATIONS.
- B. SURVEY EXISTING CONDITIONS AND CORRELATE WITH REQUIREMENTS INDICATED TO DETERMINE EXTENT OF SELECTIVE DEMOLITION REQUIRED.
- C. WHEN UNANTICIPATED MECHANICAL, ELECTRICAL, OR STRUCTURAL ELEMENTS THAT CONFLICT WITH INTENDED FUNCTION OR DESIGN ARE ENCOUNTERED, INVESTIGATE AND MEASURE THE NATURE AND EXTENT OF CONFLICT PROMPTLY SUBMIT A WRITTEN REPORT TO ARCHITECT.
- 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS
- A. EXISTING SERVICES/SYSTEMS TO REMAIN: MAINTAIN SERVICES/SYSTEMS INDICATED TO REMAIN AND PROTECT THEM AGAINST DAMAGE.
- COMPLY WITH REQUIREMENTS FOR EXISTING SERVICES/SYSTEMS INTERRUPTIONS SPECIFIED IN SECTION 011000 "SUMMARY."
- B. EXISTING SERVICES/SYSTEMS TO BE REMOVED, RELOCATED, OR ABANDONED: LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP OFF INDICATED UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS SERVING AREAS TO BE SELECTIVELY DEMOLISHED.
- BUILDING MANAGER WILL ARRANGE TO SHUT OFF INDICATED SERVICES/SYSTEMS WHEN REQUESTED BY CONTRACTOR.
- 2. ARRANGE TO SHUT OFF INDICATED UTILITIES WITH UTILITY COMPANIES.
- 3. IF SERVICES/SYSTEMS ARE REQUIRED TO BE REMOVED, RELOCATED, OR ABANDONED, PROVIDE TEMPORARY SERVICES/SYSTEMS THAT BYPASS AREA OF SELECTIVE DEMOLITION AND THAT MAINTAIN
- CONTINUITY OF SERVICES/SYSTEMS TO OTHER PARTS OF BUILDING.
 DISCONNECT, DEMOLISH, AND REMOVE FIRE-SUPPRESSION SYSTEMS, PLUMBING, AND HVAC SYSTEMS, EQUIPMENT, AND COMPONENTS INDICATED TO BE REMOVED.
- a. PIPING TO BE REMOVED: REMOVE PORTION OF PIPING INDICATED TO BE REMOVED AND CAP OR PLUG REMAINING PIPING WITH SAME OR COMPATIBLE PIPING MATERIAL.
- b. PIPING TO BE ABANDONED IN PLACE: DRAIN PIPING AND CAP OR PLUG PIPING WITH SAME OR COMPATIBLE PIPING MATERIAL.

c. EQUIPMENT TO BE REMOVED: DISCONNECT AND CAP SERVICES

- AND REMOVE EQUIPMENT.

 d. EQUIPMENT TO BE REMOVED AND REINSTALLED: DISCONNECT AND CAP SERVICES AND REMOVE, CLEAN, AND STORE
- EQUIPMENT; WHEN APPROPRIATE, REINSTALL, RECONNECT, AND MAKE EQUIPMENT OPERATIONAL.

 e. EQUIPMENT TO BE REMOVED AND SALVAGED: DISCONNECT AND CAP SERVICES AND REMOVE EQUIPMENT AND DELIVER TO
- OWNER.

 f. DUCTS TO BE REMOVED: REMOVE PORTION OF DUCTS INDICATED TO BE REMOVED AND PLUG REMAINING DUCTS WITH

SAME OR COMPATIBLE DUCTWORK MATERIAL.

- g. DUCTS TO BE ABANDONED IN PLACE: CAP OR PLUG DUCTS WITH SAME OR COMPATIBLE DUCTWORK MATERIAL.
- C. REFRIGERANT: REMOVE REFRIGERANT FROM MECHANICAL EQUIPMENT
 TO BE SELECTIVELY DEMOLISHED ACCORDING TO 40 CFR 82 AND

3.3 PREPARATION

A. TEMPORARY FACILITIES: PROVIDE TEMPORARY BARRICADES AND OTHER PROTECTION REQUIRED TO PREVENT INJURY TO PEOPLE AND DAMAGE TO ADJACENT BUILDINGS AND FACILITIES TO REMAIN.

REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

- B. TEMPORARY SHORING: PROVIDE AND MAINTAIN SHORING, BRACING, AND STRUCTURAL SUPPORTS AS REQUIRED TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF CONSTRUCTION AND FINISHES TO REMAIN, AND TO PREVENT UNEXPECTED OR UNCONTROLLED MOVEMENT OR COLLAPSE OF CONSTRUCTION BEING DEMOLISHED.
- 3.4 SELECTIVE DEMOLITION, GENERAL
- A. GENERAL: DEMOLISH AND REMOVE EXISTING CONSTRUCTION ONLY TO THE EXTENT REQUIRED BY NEW CONSTRUCTION AND AS INDICATED. USE METHODS REQUIRED TO COMPLETE THE WORK WITHIN LIMITATIONS OF GOVERNING REGULATIONS AND AS FOLLOWS:
- CONTRACTOR SHALL OBTAIN A HOT WORK PERMIT FROM THE CITY OF
 ANNI APROP.
- 2. NEATLY CUT OPENINGS AND HOLES PLUMB, SQUARE, AND TRUE TO DIMENSIONS REQUIRED. USE CUTTING METHODS LEAST LIKELY TO DAMAGE CONSTRUCTION TO REMAIN OR ADJOINING CONSTRUCTION. USE HAND TOOLS OR SMALL POWER TOOLS DESIGNED FOR SAWING OR GRINDING, NOT HAMMERING AND CHOPPING, TO MINIMIZE DISTURBANCE OF ADJACENT SURFACES. TEMPORARILY COVER OPENINGS TO DEMAIN
- 3. CUT OR DRILL FROM THE EXPOSED OR FINISHED SIDE INTO CONCEALED SURFACES TO AVOID MARRING EXISTING FINISHED
- 4. DO NOT USE CUTTING TORCHES UNTIL WORK AREA IS CLEARED OF FLAMMABLE MATERIALS. AT CONCEALED SPACES, SUCH AS DUCT AND PIPE INTERIORS, VERIFY CONDITION AND CONTENTS OF HIDDEN SPACE BEFORE STARTING FLAME-CUTTING OPERATIONS. MAINTAIN PORTABLE FIRE-SUPPRESSION DEVICES DURING FLAME-CUTTING
- LOCATE SELECTIVE DEMOLITION EQUIPMENT AND REMOVE DEBRIS
 AND MATERIALS SO AS NOT TO IMPOSE EXCESSIVE LOADS ON
 SUPPORTING WALLS, FLOORS, OR FRAMING.
- 6. DISPOSE OF DEMOLISHED ITEMS AND MATERIALS PROMPTLY.
- B. REMOVED AND REINSTALLED ITEMS:
- 1. CLEAN AND REPAIR ITEMS TO FUNCTIONAL CONDITION ADEQUATE FOR INTENDED REUSE.
- PACK OR CRATE ITEMS AFTER CLEANING AND REPAIRING. IDENTIFY CONTENTS OF CONTAINERS.
- CONTENTS OF CONTAINERS.

 3. PROTECT ITEMS FROM DAMAGE DURING TRANSPORT AND STORAGE.
- 4. REINSTALL ITEMS IN LOCATIONS INDICATED. COMPLY WITH INSTALLATION REQUIREMENTS FOR NEW MATERIALS AND EQUIPMENT. PROVIDE CONNECTIONS, SUPPORTS, AND MISCELLANEOUS MATERIALS NECESSARY TO MAKE ITEM FUNCTIONAL FOR USE INDICATED.
- C. EXISTING ITEMS TO REMAIN: PROTECT CONSTRUCTION INDICATED TO REMAIN AGAINST DAMAGE AND SOILING DURING SELECTIVE DEMOLITION. WHEN PERMITTED BY ARCHITECT, ITEMS MAY BE REMOVED TO A SUITABLE, PROTECTED STORAGE LOCATION DURING SELECTIVE DEMOLITION AND CLEANED AND REINSTALLED IN THEIR ORIGINAL LOCATIONS AFTER SELECTIVE DEMOLITION OPERATIONS ARE COMPLETE.
- 3.5 DISPOSAL OF DEMOLISHED MATERIALS
- A. GENERAL: EXCEPT FOR ITEMS OR MATERIALS INDICATED TO BE RECYCLED, REUSED, SALVAGED, REINSTALLED, OR OTHERWISE INDICATED TO REMAIN OWNER'S PROPERTY, REMOVE DEMOLISHED MATERIALS FROM PROJECT SITE AND LEGALLY DISPOSE OF THEM IN AN EPA-APPROVED LANDFILL.
- 1. DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON-SITE.
- B. BURNING: DO NOT BURN DEMOLISHED MATERIALS.
- C. DISPOSAL: TRANSPORT DEMOLISHED MATERIALS OFF OWNER'S PROPERTY AND LEGALLY DISPOSE OF THEM.
- 3.6 CLEANING
- A. CLEAN ADJACENT STRUCTURES AND IMPROVEMENTS OF DUST, DIRT, AND DEBRIS CAUSED BY SELECTIVE DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO CONDITION EXISTING BEFORE SELECTIVE DEMOLITION OPERATIONS BEGAN.

051200 STRUCTURAL STEEL FRAMING:

- 1. THE STRUCTURAL STEEL PORTIONS OF THIS STRUCTURE ARE DESIGNED ACCORDING TO THE ALLOWABLE STRESS DESIGN PROVISIONS OF THE 9TH EDITION OF THE AISC MANUAL OF STEEL CONSTRUCTION, THE LOAD AND RESISTANCE FACTOR DESIGN PROVISIONS OF THE 2ND EDITION AISC MANUAL OF STEEL CONSTRUCTION INCLUDING SECTIONS 2204 AND 2211 OF CHAPTER 22 IN THE MICHIGAN BUILDING CODE. STEEL COMPONENTS HAVE BEEN DESIGNED ACCORDING TO THE PROVISIONS FOR SEISMIC DESIGN CATEGORY B.
- 2. STEEL DETAILING, FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH THE LATEST AISC SPECIFICATIONS FOR "STRUCTURAL STEEL BUILDINGS"
- 3. ALL STRUCTURAL STEEL SHALL CONFORM TO THE LATEST ASTM SPECIFICATIONS ACCORDING TO THE FOLLOWING SERIAL DESIGNATIONS
- WIDE FLANGES AND TEES: A992 OR ASTM A572, Fy=50 KSI
 ANGLES, CHANNELS, BARS AND PLATES: A36
 SQUARE OR RECTANGULAR HOLLOW STRUCTURAL SHAPES OR
- TUBES: ASTM A500, GR. B, Fy=46 KSI

 ROUND HOLLOW STRUCTURAL SHAPES OR PIPES: ASTM A53;
 GRADE B, Fy=35 KSI
- 4. ALL WELDED CONNECTIONS SHALL CONFORM TO THE LATEST AWS CODE, USING E7OXX ELECTRODES, WITH WELDING PERFORMED BY QUALIFIED WELDERS.
- 5. BOLTED CONNECTIONS SHALL BE MADE WITH A325-N OR A490-N BOLTS. LOCATIONS OF SLIP CRITICAL CONNECTIONS SHALL BE AS NOTED ON THE DRAWINGS, IF REQUIRED. ALL BOLTS ARE TO BE INSTALLED IN ACCORDANCE WITH THE LATEST AISC SPECIFICATIONS FOR "STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS".
- 6. THE DESIGN, CONFIGURATION, ERECTION SAFETY AND SEQUENCING OF ALL STRUCTURAL STEEL CONNECTIONS SHALL BE THE RESPONSIBILITY OF THE STRUCTURAL STEEL FABRICATOR. REVIEW AND ACCEPTANCE OF THE SHOP DRAWINGS BY THE ENGINEER SHALL CONSTITUTE APPROVAL OF THE LOAD CARRYING ADEQUACY ONLY.
- 7. CONNECTIONS SHALL BE DESIGNED FOR ONE-HALF THE TOTAL ALLOWABLE UNIFORM LOAD (MIN.) PER AISC BEAM LOAD TABLES, UNLESS NOTED OTHERWISE.
- 8. TEMPORARY ERECTION SEATS SHALL BE PROVIDED AS RECOMMENDED ON PAGE 3-59 OF THE LATEST EDITION AISC PUBLICATION "ENGINEERING FOR STEEL CONSTRUCTION".
- 9. THE DESIGN OF STEEL FRAMED STAIRS SHALL BE THE RESPONSIBILITY OF THE STEEL FABRICATOR. PROVIDE COMPLETE ENGINEERED STAIR ASSEMBLIES, CONFORMING TO THE ARCHITECTURAL INTENT, UNDER THE SEAL OF AN ENGINEER REGISTERED IN THE STATE OF MICHIGAN, INCLUDING METAL FRAMING, HANGERS, MASONRY BEARING PLATES, COLUMNS, RAILING ASSEMBLIES, AND OTHER COMPONENTS NECESSARY TO SUPPORT THE STAIRS AND LANDINGS INCLUDING ANCHORAGE TO THE SUPPORTING STRUCTURE.

- 10. DRILLED-IN ANCHORS SHALL BE EITHER "UNDERCUT" OR "ADHESIVE" AS INDICATED ON THE DRAWINGS. INSTALLATION OF DRILLED-IN ANCHORS SHALL BE IN COMPLIANCE WITH MANUFACTURER'S LITERATURE AND GUIDELINES. EXPANSION BOLTS SHALL BE "HILTI KWIK BOLT II" OR APPROVED EQUAL. ADHESIVE SHALL BE "HILTI HIT HY-200" OR APPROVED EQUAL.
- 11. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL ANGLES, PLATES, BARS, CLIPS, ETC., ATTACHED TO STRUCTURAL STEEL. VERIFY EXACT SIZE AND LOCATION OF ALL FLOOR AND ROOF OPENINGS WITH CONTRACTOR INVOLVED. IN ADDITION TO L5x3 1/2x5/16 (L.L.V.) PERIMETER CURB SUPPORT FRAMES, PROVIDE L3x3x1/4 FRAMES AT OPENINGS UNDER MECHANICAL UNITS TO SUPPORT METAL DECK. FAILURE TO CONSULT ALL DRAWINGS FOR REQUIRED STEEL SHALL NOT CONSTITUTE A BASIS FOR EXTRAS

-----=======**‡** 7'-4" EX. STEEL BEAMS TO BE REMOVED (V.I.F) NEW CHILLER (REFER TO MECHANICAL) EL. = 188'-0" V.I.F. — CONT. L5x4x3/8 (LLH) —— EX. STEEL BEAM (W12X27) V.I.F. 5/8" PLATE @ 36" O.C. FIELD WELD TO EXIST EX. CONC. PEDESTAL & DECK (V.I.F.) EL. = 185'-8" V.I.F. EX. STEEL BEAM (W18X60) V.I.F. CHILLER SUPPORT DETAI SCALE: 1 1/2" = 1'-0"

OVERVIEW OF ARCHITECTURAL SCOPE

THIS OVERVIEW OF SCOPE IS INCLUDED TO GIVE THE CONTRACTOR A GENERAL OVERVIEW OF THE PROJECT REQUIREMENTS. THE OVERVIEW IS NOT ALL INCLUSIVE AND IS NOT INTENDED TO, AND SHOULD NOT BE USED TO, ESTABLISH CONTRACT LIMITS OR PRICING INCLUSIONS. THE CONTRACT DOCUMENTS SHALL BE USED TO ESTABLISH CONSTRUCTION CONTRACT SCOPE.

THIS OVERVIEW OF SCOPE INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:

ARCHITECTURAL:

- 1. DEMOLITION OF STEEL BEAMS AS INDICATED.
- PATCH AND REPAIR WALL PENETRATIONS.
 REMOVE CONCRETE HOUSEKEEPING PADS AT PUMPS CP1 & CP2 (R
- REMOVE CONCRETE HOUSEKEEPING PADS AT PUMPS CP1 & CP2 (REFER TO MECHANICAL DRAWING FOR LOCATIONS). REPAIR CONCRETE SLAB TO MATCH ADJACENT FLOOR ELEVATION AND FINISH.

PROJECT REQUIREMENTS

PROVIDE ALL NECESSARY PERMITS. ALL WORK SHALL BE INSTALLED TO COMPLY WITH THE OWNER'S STANDARDS, STATE AND LOCAL CODES INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING CODES AND THEIR RELATED REFERENCES.

- 2015 MICHIGAN MECHANICAL CODE
- 2015 MICHIGAN PLUMBING CODE
- 2015 INTERNATIONAL FIRE CODE (AS REFERENCED)
- 2015 INTERNATIONAL FUEL GAS CODE

 NFPA 101 LIFE SAFETY CODE 1997 AND 2006 (AS REFERENCED)
- MICHIGAN ENERGY CODE-ASHRAE 90.1-2013
 2014 NATIONAL ELECTRICAL CODE AS AMENDED BY THE 2014 MICHIGAN
- ELECTRICAL CODE RULES, PART 8.
 2015 MICHIGAN BUILDING CODE

MANUFACTURER AND MODEL NUMBER LISTED REPRESENTS THE BASIS OF DESIGN FOR THIS PROJECT. THE CONTRACTOR SHALL BEAR ALL ADDITIONAL COSTS ASSOCIATED WITH USING EQUIPMENT AND/OR SYSTEMS BY OTHER APPROVED MANUFACTURERS INCLUDING ADDITIONAL COSTS BY OTHER TRADES.

ALL EQUIPMENT AND/OR SYSTEMS INSTALLED SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. WHERE FIELD OR PROJECT CONDITIONS DO NOT ALLOW ALL MANUFACTURER'S RECOMMENDATIONS TO BE MET, THE INSTALLING CONTRACTOR SHALL SUBMIT IN WRITING TO THE ARCHITECT THE PROPOSED DEVIATION, IN A SKETCH FORM, ACCOMPANIED BY THE MANUFACTURER'S CONCURRENCE.

GENERAL NOTES:

VERIFY EXISTING CONDITIONS IN FIELD.

REQUIREMENTS, TYPICAL.

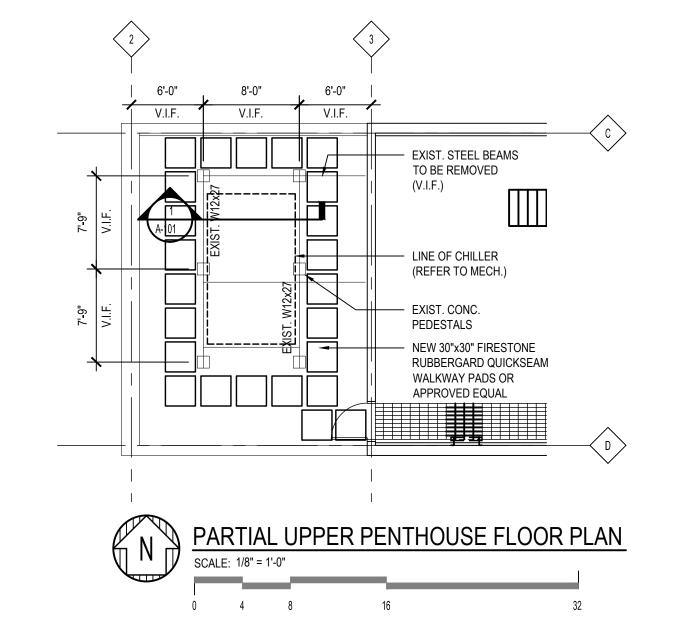
- 2. NOTIFY OWNER & ARCHITECT IMMEDIATELY IF CONDITIONS DO NOT MATCH WHAT IS INDICATED ON DOCUMENTS.
- 3. FOR MECHANICAL AND ELECTRICAL DEMOLITION WORK AND NEW WORK, REFER TO MECHANICAL AND ELECTRICAL DWGS.

 4. AS REQUIRED BATCH, REPAIR AND OR PAINT / REPLACE AD IACENT SUBFACES.
- 4. AS REQUIRED PATCH, REPAIR AND OR PAINT / REPLACE ADJACENT SURFACES TO MATCH ORIGINAL CONDITIONS WHERE PROPOSED ARCH. & M.E.P. WORK (INCLUDING INSTALLATION OF M.E.P. EQUIPMENT) DISTURBED EXISTING CONDITIONS.
- 5. ALL SPACES ARE TO BE CLEANED AND ANY DAMAGE CAUSED BY THE CONTRACTOR IS TO BE PATCHED, REPAIRED AND OR PAINTED / REPLACED TO MATCH ORIGINAL CONDITIONS ONCE WORK IS COMPLETED.
 6. PROTECT ALL FINISH WORK TO REMAIN FROM DAMAGE DURING DEMOLITION
- BE AT THE CONTRACTORS EXPENSE, TYPICAL.

 7. REFER TO OTHER SHEETS OF THIS DOCUMENT SET FOR COMPLETE CONTRACT

AND CONSTRUCTION, TYPICAL. REPAIR OF DAMAGED EXISTING FINISHES WILL

- 8. REFER TO NEW WORK DRAWINGS FOR SIZES AND EXTENT OF NEW INSTALLATIONS/LAYOUTS. PROVIDE DEMOLITION AS REQUIRED TO ACCOMMODATE THE ENTIRE NEW SCOPE OF WORK AS DELINEATED IN THESE DRAWINGS. REFER TO THE COVER SHEET FOR THE COMPLETE DRAWING INDEXES.
- 9. THE ROOF IS UNDER WARRANTY AND WILL BE INSPECTED BOTH BEFORE THE CONTRACTOR MOBILIZES AND AFTER DEMOBILIZATION TO CONFIRM THAT THERE ARE NOT DAMAGES CAUSED BY CONSTRUCTION ACTIVITIES OF THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF THE ROOF DURING THEIR CONSTRUCTION ACTIVITIES AND MUST SUPPLY AT A MINIMUM RIGID FOAM BOARD COVERED BY 3/4" PLYWOOD TO PROTECT THE ROOF WHERE WORK IS TO OCCUR. CONTRACTOR TO ARRANGE BOTH PRE-CONSTRUCTION AND POST-CONSTRUCTION CONFERENCES/ INSPECTIONS. CONTACT FOR ANY ROOFING PENETRATIONS OR REPAIRS IS CEI, MICHIGAN OUT OF HOWELL, MI (517-548-0039). THE ROOF WAS A PRODUCT OF FIRESTONE ROOFING SYSTEMS (800-830-5612).
- 10. WHERE NEW WORK DISTURBS EXISTING SPRAY-ON FIREPROOFING AT EXISTING BEAMS, DECK, OR PIPING, PROVIDE NEW 2 HR. MIN. THICKNESS SPRAY-ON



FIREPROOFING ONCE WROK IS COMPLETE.

SHEET NOTES:

- 1. ENTER SHEET NOTE 1 HERE
- 2. ENTER SHEET NOTE 2 HERE

DEMOLITION KEYED NOTES: (APPLICABLE THIS SHEET ONLY)

1 XXXX

2 XXXX

NEW WORK KEYED NOTES: (APPLICABLE THIS SHEET ONLY)

1 XXXX

2 XXXX

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Engineering and Architecture

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CITY OF ANN ARBOR

LARCOM CHILLER

REPLACEMENT PROJECT

ANN ARBOR, MI

ARCHITECTURAL GENERAL

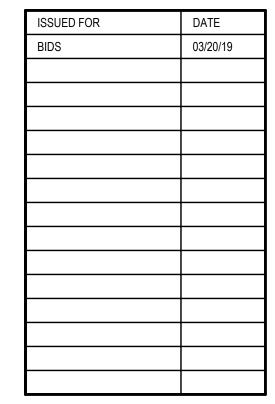
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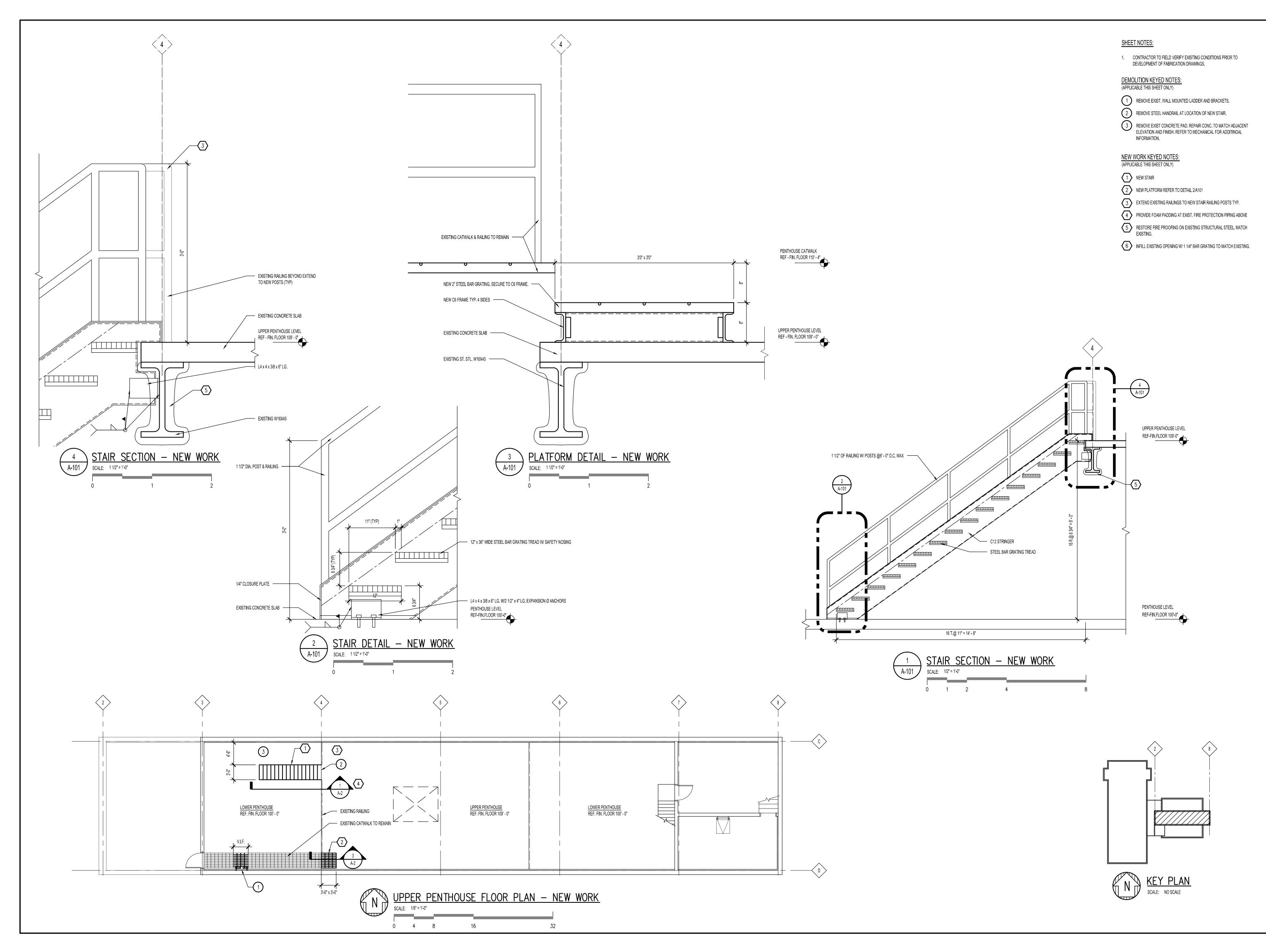
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ACADFILE: 18-1304-A-1

PROJECT No. 18-1304

A-1





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CITY OF ANN ARBOR
LARCOM CHILLER
REPLACEMENT PROJECT
ANN ARBOR, MI

ARCHITECTURAL PENTHOUSE PLAN & DETAILS

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ISSUED FOR	DATE
BIDS	03/20/19
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A-2						
18-1304						
18-1304-A-2						
JSR						
JSR/BJR						
LTS						
03/20/19						

	SY	MBOL LEGEND
TWO LINE SYMBOLS	SCHEMATIC SYMBOLS	DESCRIPTION
		EXISTING TO REMAIN
	4//////////////////////////////////////	EXISTING TO BE REMOVED
		NEW WORK
•	•	NEW CONNECTION TO EXISTING
		PIPING ELBOW
	o	PIPING ELBOW UP
	——-ə	PIPING ELBOW DOWN
		PIPING TEE
0		PIPING TEE UP
0		PIPING TEE DOWN
		DIELECTRIC UNION OR FLANGE CONNECTION
\longrightarrow	\longrightarrow	ISOLATION VALVE
	 X	GATE VALVE
	——————————————————————————————————————	CHECK VALVE
	——————————————————————————————————————	BUTTERFLY VALVE
M —	M—	MOTORIZED DEVICE
[S]	<u>[S]</u>	SOLENOID VALVE
——	<u></u> -Б	BALL VALVE
	—×—	GLOBE VALVE
	— № — →	LUBRICATED PLUG VALVE
 \$		BALANCE VALVE
		CONTROL VALVE - 2 WAY
——————————————————————————————————————	——————————————————————————————————————	CONTROL VALVE - 3 WAY
	-	BACKWATER VALVE
	-+	STRAINER
	<u></u>	THERMOMETER
		PRESSURE GAUGE WITH BALL VALVE
	—₩\$ - ₩	CIRCUIT SETTER
		FLOW METER
	—×—	PIPE ANCHOR
<u>-</u>	_=	PIPE GUIDE
-		FLOW ARROW
		CONCENTRIC REDUCER (PIPE OR DUCT)
		ECCENTRIC REDUCER (PIPE OR DUCT)

SYMBOL	DESCRIPTION
ABV	ABOVE
A.F.F.	ABOVE FINISHED FLOOR
A.H.U.	AIR HANDLING UNIT
B.O.D.	BOTTOM OF DUCT
B.O.P.	BOTTOM OF PIPE
CHWP	CHILLED WATER PUMP
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
DN	DOWN
EXH.	EXHAUST
F.D.	FLOOR DRAIN
FLR.	FLOOR
I.E.	INVERT ELEVATION
M.B.H.	THOUSAND BTU/HR (BRITISH THERMAL UNITS PER HOUR)
N.I.C.	NOT IN CONTRACT
P.R.V.	PRESSURE REDUCING VALVE
P.T.	PLUGGED TEE
R.A.	RETURN AIR
R.A.F.	RETURN AIR FAN
S.A.	SUPPLY AIR
SAN	SANITARY PIPE
TYP.	TYPICAL
V	VENT

	PIPING LEGEND							
SYMBOL	DESCRIPTION							
CHWR	CHILLED WATER RETURN							
CHWS	CHILLED WATER SUPPLY							
CWR	CONDENSER WATER SUPPLY							
cws	CONDENSER WATER SUPPLY							

	AIR COOLED CHILLER SCHEDULE																								
		0)/07514	NOMINAL			EVAPORAT	TOR				CO	NDENSER					COMPRESSO	DR .		UNIT POWE	-R			D4010 05 D501011	
MARK	LOCATION	SYSTEM SERVED	CAPACITY	E.W.T.	L.W.T.	NO. OF	 GPM	MAX. PRESS.	FLUID	FOULING	AMBIENT	NO. OF	HP	FER	IPLV	TYPE	REFRIGERANT	NUMBER OF INDEPENDENT	·	_	_	DIMENSION	OPERATING WEIGHT	BASIS OF DESIGN MODEL NUMBER	REMARKS
		GERVED	(TONS)	°F	°F	PASSES	Oi W	DROP (FT.)	TEOID	FACTOR	°F	FANS	EACH	LLIX	(BTU/W-h)	11112	REPRIORITATION	REFRIGERANT CIRCUITS	KW	VOLTAGE	PHASE			WODELTOWNER	
C-4	ENCLOSED ROOF	CHILLED WATER	68.4	55	45	-	176.1	47.3	35% PROPYLENE GLYCOL	0.0001	95	6	1.6	10.79	16.85	SCROLL	R-410A	2	76	460	1	149.8"L x 88.4"W x 84"H	5193.6	TRANE CGAM-70	*SEE NOTES 1, 2, 3 AND 4

* NOTES:

- 1. PROVIDE EVAPORATOR IMMERSION HEATER CONNECTION, 115V, LOW AMP, 1φ POWER CONNECTION.
- 2. PROVIDED WITH TRANE CH530 MICROPROCESSOR.
- 3. PROVIDED WITH UNIT MOUNTED STARTER, UL1995 LIGHT.
- 4. PROVIDE SINGLE SOURE POWER CONNECTIONS.

ARCHITECTURAL - MECHANICAL - ELECTRICAL COORDINATION SCHEDULE												
MARK	LOCATION	HP	KW	/ NGA	ELECTRICAL		DISCONNECT		STARTER		REMARKS	
IVIANN	LOCATION		I WW	MCA	VOLTAGE	PHASE	FURN.	INST.	FURN.	INST.	NEWARKS	
C-4	ENCLOSED ROOF	-	76	147.8A	460	3	Е	E	S	S	-	
C-4 FREEZE PROTECTION HEATER	ENCLOSED ROOF	-	-	15A	120	1	E	E	S	S	SEPARATE CIRCUIT CONNECTION FOR FREEZE PROTECTION HEATER TO NEW C-4 CHILLER	
LEGEND												

S = SUPPLIER (MANUFACTURER)*

M = MECHANICAL

E = ELECTRICAL

VFD = VARIABLE FREQUENCY DRIVE

	-	-	15A	120	1	E	E		
<u>LEGEND</u>									
		С		= CHILL	ER				

CP = CHILLED WATER PUMP

* - ITEMS INDICATED AS SUPPLIER SHALL BE PROVIDED WITH THE ITEM/ EQUIPMENT OR BY THE CONTRACTOR PURCHASING THE ITEM/EQUIPMENT

MECHANICAL SHEET INDEX							
SHEET	DESCRIPTION						
M-1	MECHANICAL GENERAL INFORMATION & SCHEDULES						
M-2	PENTHOUSE FLOOR & ROOF DEMOLITION PLANS						
M-3	PENTHOUSE FLOOR & ROOF NEW WORK PLANS						
M-4	CHW CONTROL SEQUENCE						
M-5	HW CONTROL SEQUENCE						

OVERVIEW OF MECHANICAL SCOPE

THIS OVERVIEW OF SCOPE IS INCLUDED TO GIVE THE CONTRACTOR A GENERAL OVERVIEW OF THE PROJECT REQUIREMENTS. THE OVERVIEW IS NOT ALL INCLUSIVE AND IS NOT INTENDED TO, AND SHOULD NOT BE USED TO, ESTABLISH CONTRACT LIMITS OR PRICING INCLUSIONS. THE CONTRACT DOCUMENTS SHALL BE USED TO ESTABLISH CONSTRUCTION CONTRACT SCOPE.

THIS OVERVIEW OF SCOPE INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:

- 1. DEMOLISH AND REMOVE EXISTING NATURAL GAS FIRED CHILLER, AND ASSOCIATED GAS PIPING AND CHILLED WATER CONNECTIONS. DEOMOLISH EXISTING COOLING TOWER, CONDENSER WATER TANK, CONDENSER WATER PUMPS AND ASSOCIATED PIOING. 2. PROVIDE NEW ROOF MOUNTED AIR COOLED CHILLER. PROVIDE NEW CHILLED WATER PIPING
- TO CONNECT TO EXISTING CHILLED WATER PIPING SYSTEM. 4. MODIFY CHILLED WATER CONTROL SYSTEM TO ACCOMMODATE NEW CHILLER AND CONTROL
- SEQUENCE.
- 5. MODIFY HEATING HOT WATER CONTROL SYSTEM AS INDICATED.

PROJECT REQUIREMENTS

PROVIDE ALL NECESSARY PERMITS. ALL WORK SHALL BE INSTALLED TO COMPLY WITH THE OWNER'S STANDARDS, STATE AND LOCAL CODES INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING CODES AND THEIR RELATED REFERENCES.

2015 MICHIGAN MECHANICAL CODE

2015 MICHIGAN PLUMBING CODE

2015 INTERNATIONAL FIRE CODE (AS REFERENCED)

2015 INTERNATIONAL FUEL GAS CODE

NFPA 101 LIFE SAFETY CODE 1997 AND 2006 (AS REFERENCED)

MICHIGAN ENERGY CODE-ASHRAE 90.1-2013

2014 NATIONAL ELECTRICAL CODE AS AMENDED BY THE 2014 MICHIGAN ELECTRICAL CODE RULES, PART 8.

2015 MICHIGAN BUILDING CODE

MANUFACTURER AND MODEL NUMBER LISTED REPRESENTS THE BASIS OF DESIGN FOR THIS PROJECT. THE MECHANICAL CONTRACTOR SHALL BEAR ALL ADDITIONAL COST ASSOCIATED WITH USING EQUIPMENT BY OTHER APPROVED MANUFACTURERS INCLUDING ADDITIONAL COSTS BY OTHER

ALL EQUIPMENT INSTALLED SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. WHERE FIELD OR PROJECT CONDITIONS DO NOT ALLOW ALL MANUFACTURER'S RECOMMENDATIONS TO BE MET, THE INSTALLING CONTRACTOR SHALL SUBMIT IN WRITING TO THE ENGINEER THE PROPOSED DEVIATION, IN A SKETCH FORM, ACCOMPANIED BY THE MANUFACTURER'S CONCURRENCE.

GENERAL START UP, CONTROL AND BALANCE NOTES

- 1. START UP EACH NEW AND MODIFIED PIECE OF MECHANICAL EQUIPMENT SHALL RECEIVE A START UP. PACKAGED EQUIPMENT WITH MOTORS SHALL INCLUDE A FACTORY REPRESENTATIVE START UP, OTHER EQUIPMENT SHALL RECEIVE A MECHANICAL CONTRACTOR OR PLUMBING CONTRACTOR START UP (BASED ON WHO PURCHASED THE EQUIPMENT OR WHO IT WAS ASSIGNED TO). START UP REPORTS SHALL INCLUDE A FUNCTIONAL TEST OF ALL MODES OF OPERATION AND A WITNESSED REPORT OF THE VALIDATION (BY THE CONTRACTOR, WHERE PERFORMED BY THE SUPPLIER OR THE OWNER'S REPRESENTATIVE WHERE PERFORMED BY THE CONTRACTOR).
- 2. TEMPERATURE CONTROL CONTRACTOR (TCC) OR TEMPERATURE CONTROL WIRING CONTRACTOR SHALL PERFORM A DOCUMENTED STARTUP ON THE MECHANICAL CONTROLS. THIS SHALL VALIDATE THE START UP REPORT.
- 3. EACH SYSTEM SHALL BE TESTED IN EACH MODE OF OPERATION.
- 4. DISCHARGE AIR TEMPERATURE, PRESSURE AND OTHER SYSTEM PARAMETERS ARE TO BE RECORDED DURING TESTING.
- 5. TEST IS TO SIMULATE VARYING SPACE DEMAND TO PROVE THE SYSTEM CONTROLS ARE AUTOMATICALLY FUNCTIONING.
- 6. SYSTEM SAFETY FEATURES (FREEZE THERMOSTATS, HIGH PRESSURE, ETC.) ARE TO BE TESTED TO PROVE OPERATION.
- 7. TCC SHALL PROVIDE A WRITTEN REPORT FOR EACH CONTROLLED COMPONENT SHOWING
- TESTING AND PROPER OPERATION.
- 8. TEST AND BALANCE EACH NEW OR MODIFIED SYSTEM SHALL RECEIVE A HYDRONIC AND/OR AIR TEST AND BALANCE AT THE CONCLUSION OF THE INSTALLATION (AND AS DESIGNATED OTHERWISE). THE MINIMUM BALANCE SHALL INCLUDE THE SYSTEM TOTALS OF THE MAIN EQUIPMENT DELIVERING THE AIR OR WATER (INCLUDING THE HP, BHP, MOTOR AMPS, RPM AND FLOW RATES) AS WELL AS INDIVIDUAL BALANCES OF EACH ITEM MODIFIED AS A PART OF THE PROJECT, (EACH DIFFUSER, COIL, ETC.). WHERE NEW SYSTEMS ARE PROVIDED, A FULL TEST AND BALANCE SHALL BE PROVIDED IN ACCORDANCE WITH ASHRAE HVAC APPLICATIONS HANDBOOK.



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CITY OF ANN ARBOR LARCOM CHILLER REPLACEMENT PROJECT ANN ARBOR, MI

> **MECHAICAL INFORMATION & SCHEDULES**

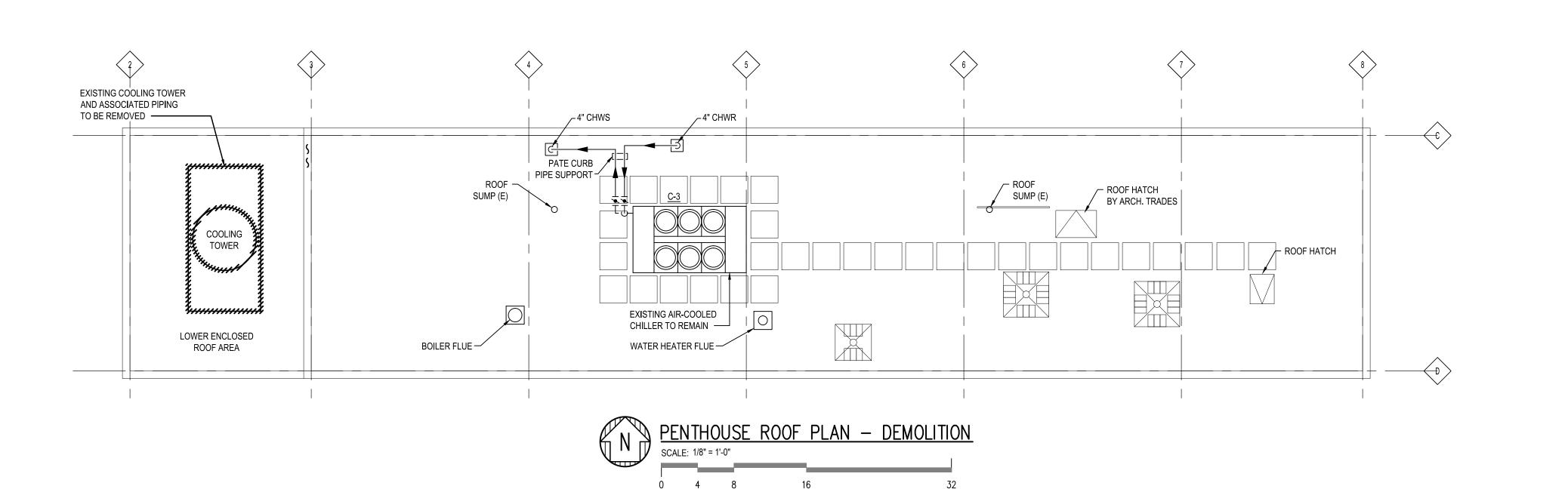
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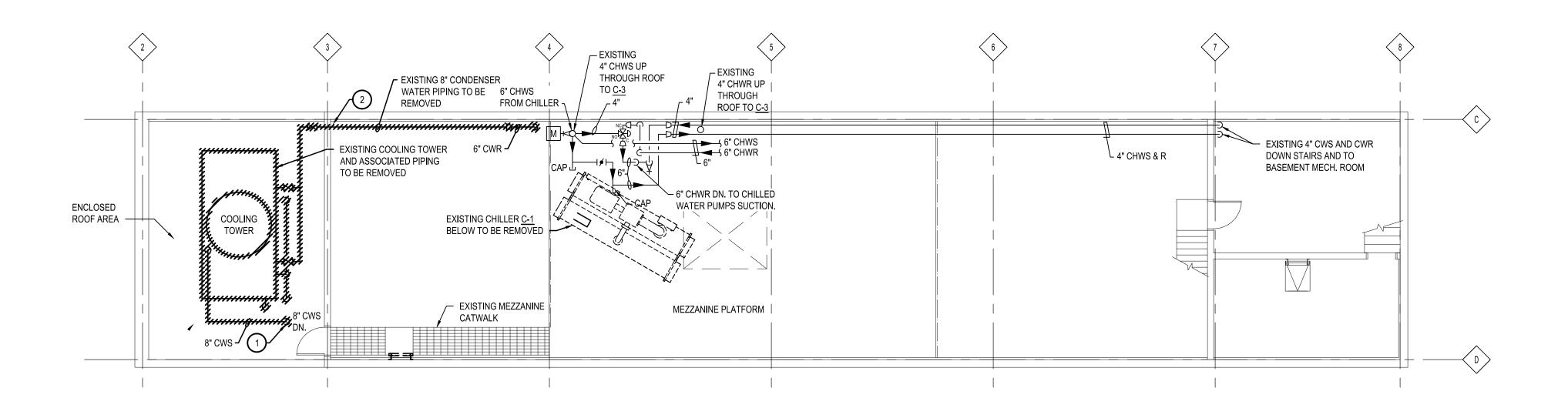
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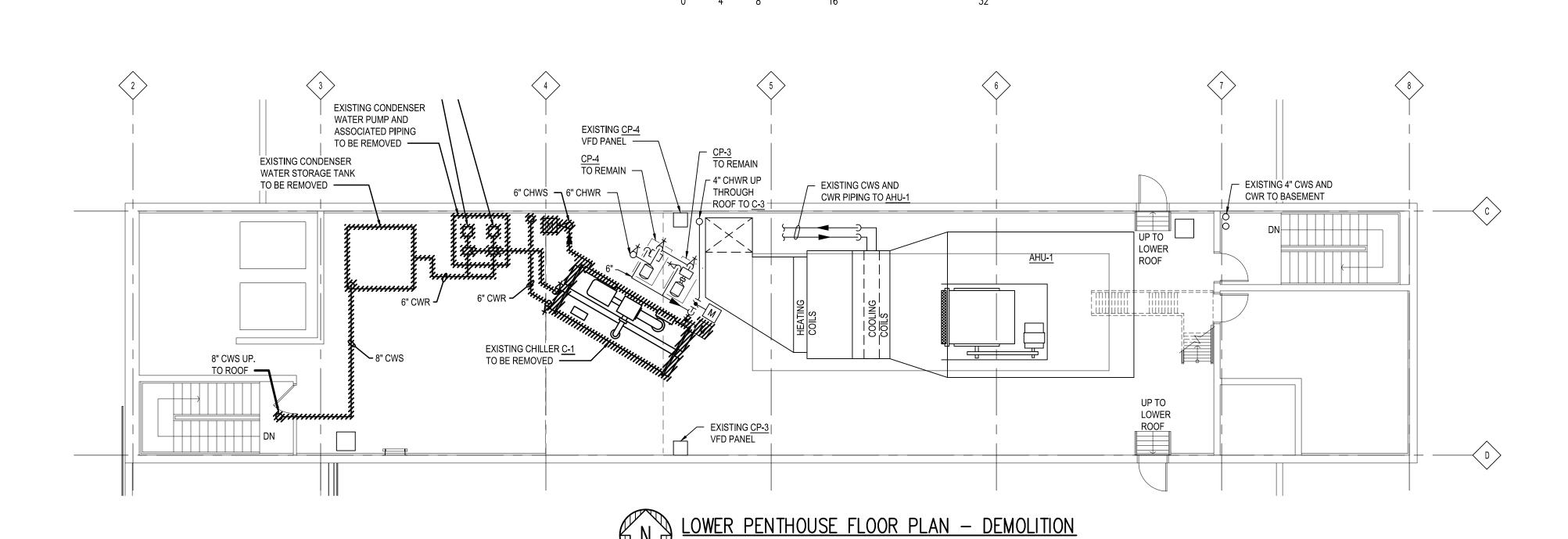
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FINAL OWNER REVIEW	02/08/19
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DESIGNER:	MJB
DRAWN:	DMN
PM / PIC:	JSR/BJR
CHECKED:	DCM
ACADFILE:	18-1304-M-1
PROJECT No.	18-1304





<u>UPPER PENTHOUSE FLOOR PLAN - DEMOLITION</u>



DEMOLITION GENERAL NOTES

- 1. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
- 2. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
 - 3. ALL MECHANICAL ITEMS TO BE REMOVED SHALL BE REMOVED COMPLETE WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTWORK.
- 4. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT BEING REMOVED.

DEMOLITION KEYED NOTES: (APPLICABLE THIS SHEET ONLY)

- 1 REMOVE PIPING THRU FLOOR AND PIPE CURB. PATCH ROOF PENETRATION TO MATCH EXISTING ADJACENT.
- 2 REMOVE PIPING THRU WALL AND MAKE WATER TIGHT.



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REPLACEMENT PROJECT
ANN ARBOR, MI

PENTHOUSE FLOOR & ROOF DEMOLITION PLANS

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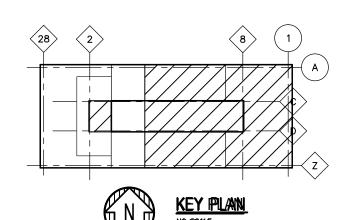
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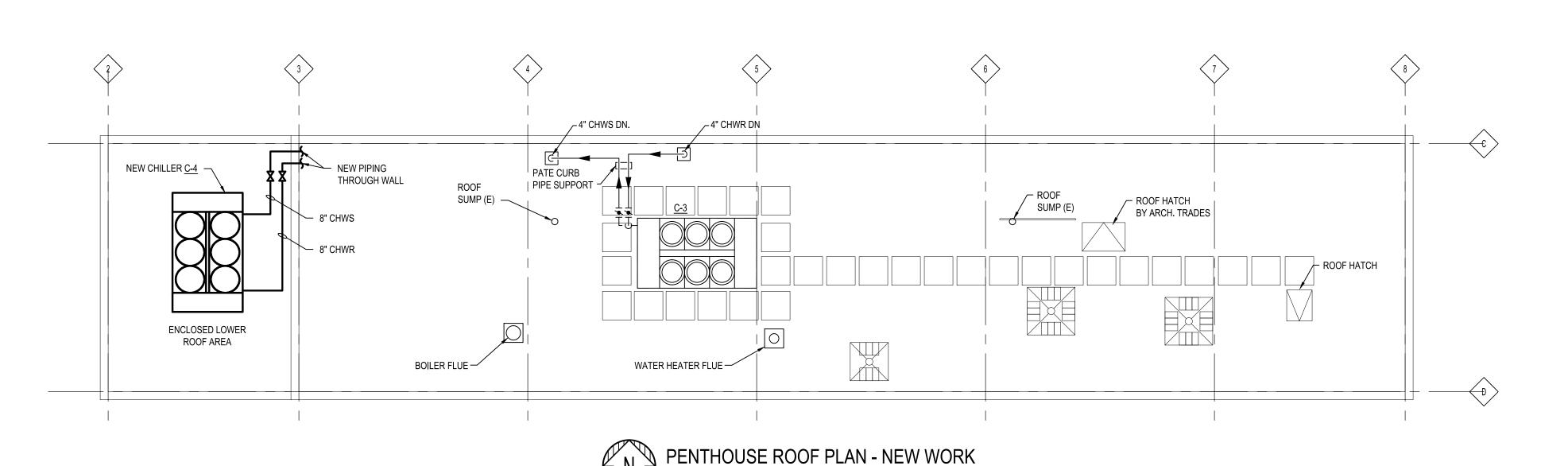
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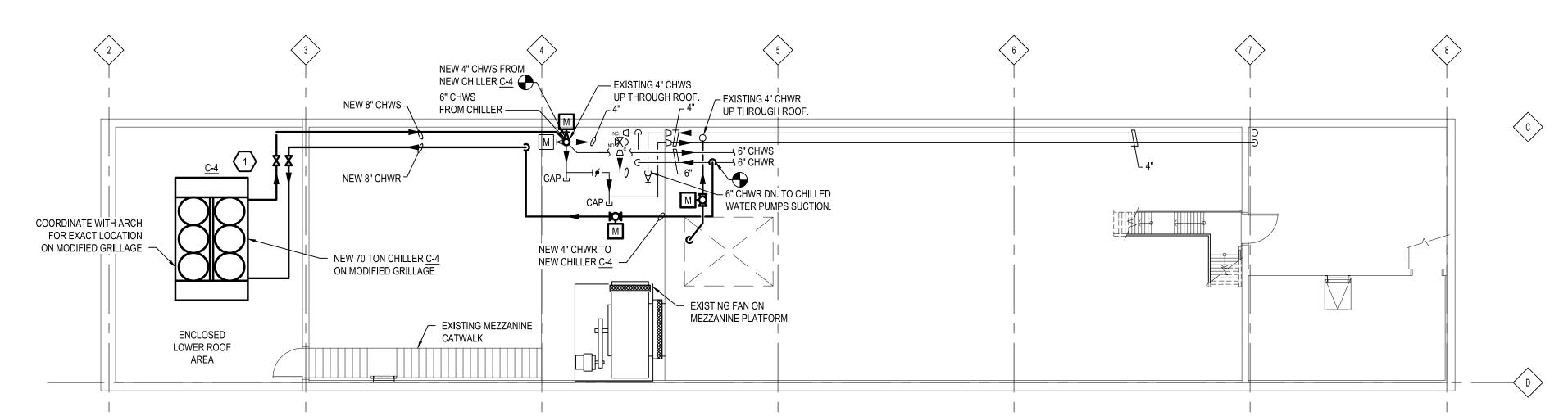
M-2

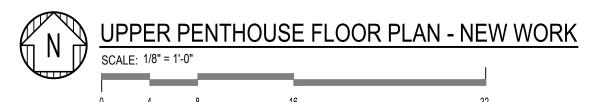


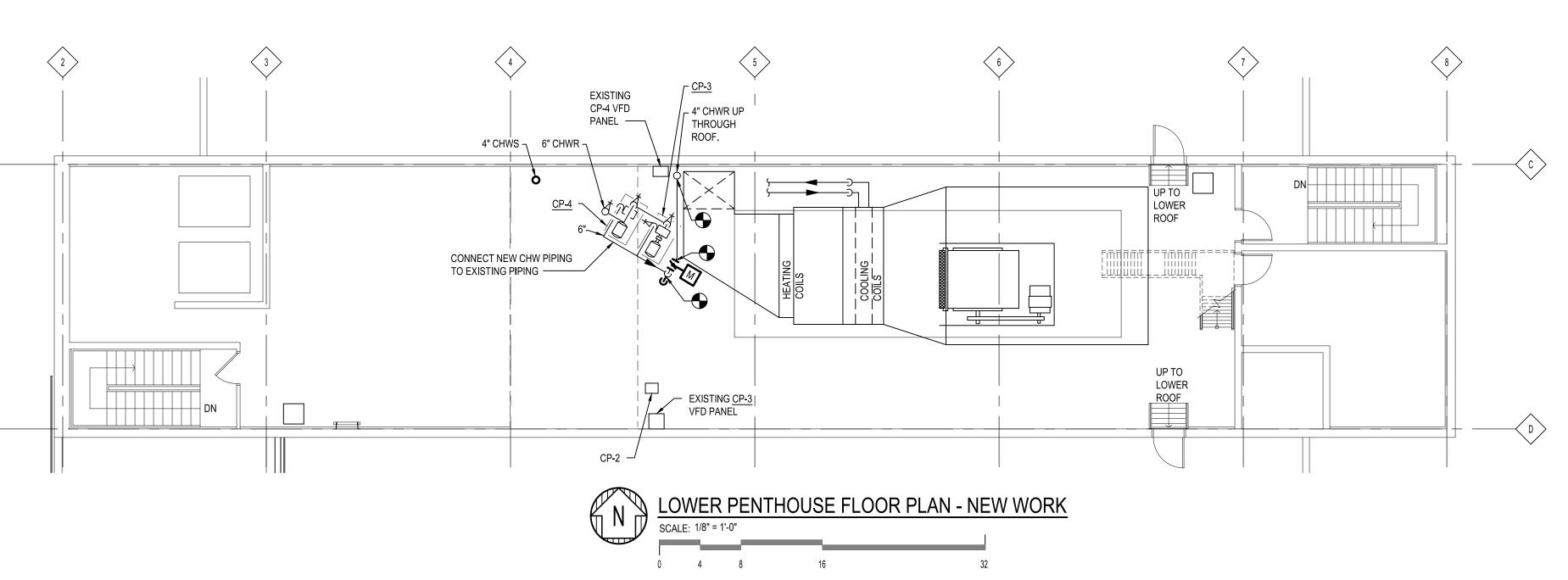
NEW WORK KEYED NOTES:

(APPLICABLE THIS SHEET ONLY)

MOUNT NEW CHILLER ON SUPPORT STEEL. REFER TO SHEET A-1 FOR SUPPORT DETAILS. MOUNT CHILLER WITH RESTRAINED SPRING ISOLATORS WITH MINIMUM DEFLECTION OF 1.50 INCHES.







MECHANICAL GENERAL NOTES

- 1. THESE DRAWINGS ARE DIAGRAMMATIC & INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE PIPING SYSTEMS COMPLETE AND PER SPECIFICATIONS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, AND FITTINGS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR OTHER CONDITIONS.
- CONTRACTOR SHALL COORDINATE HIS WORK WITH THE WORK OF ALL OTHER TRADES. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY WORK.
- 3. THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
- 4. COORDINATE ROOF PENETRATION LOCATIONS WITH ARCHITECTURAL AND STRUCTURAL TRADES.
- 5. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
- 6. PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES
- 7. PLUMBING VENT PIPING THRU THE ROOF SHALL BE LOCATED 10' FROM ANY FRESH AIR INTAKE LOCATION AND A MINIMUM OF 18" CLEAR FROM THE INSIDE FACE OF PARAPET.

MECHANICAL SPECIFICATIONS:

REQUIRING ACCESS.

PIPING INSULATION: INDOOR SHALL BE FIBERGLASS WITH FACTORY-APPLIED VAPOR BARRIER JACKET WITH SELF-SEALING LAPS, 1" THICK, ASTM C547, CLASS 1. MANUFACTURER: JOHNSON-MANVILLE MICRO-LOK 650 AP-T; OWENS/CORNING FIBERGLAS ASJ/SSLII.

OUTDOOR SAME AS ABOVE EXCEPT 1-1/2" THICK AND WITH PVC WATERPROOF INSULATION JACKETING. MANUFACTURER: ZESTON; CEECO; PROTO.

AIR COOLED CHILLER

THE UNIT SHALL HAVE HERMETIC, DIRECT-DRIVE, 3600 RPM 60 HZ SUCTION
GAS-COOLED SCROLL COMPRESSORS. THE COMPRESSOR INCLUDES: CENTRIFUGAL
OIL PUMP, OIL LEVEL SIGHT GLASS AND OIL CHARGING VALVE. EACH COMPRESSOR
WILL HAVE COMPRESSOR HEATERS INSTALLED AND PROPERLY SIZED TO MINIMIZE THE
AMOUNT OF LIQUID REFRIGERANT PRESENT IN THE OIL SUMP DURING OFF CYCLES.
COMPRESSORS SHALL HAVE WEATHERPROOF ENCLOSURE TO REDUCE COMPRESSOR

SOUND LEVEL.
THIS UNIT SHALL HAVE AN ACROSS-THE-LINE CONFIGURATION STARTER,
FACTORY-MOUNTED, AND FULLY PRE-WIRED TO THE COMPRESSOR MOTOR AND

CONTROL PANEL.
A FACTORY-INSTALLED, FACTORY-WIRED 120 VA CONTROL POWER TRANSFORMER
PROVIDES ALL UNIT CONTROL POWER (120 VAC SECONDARY) AND MODULE POWER (24 VAC SECONDARY).

A MOLDED CASE HIGH INTERRUPTING CAPACITY CIRCUIT BREAKER, FACTORY
PRE-WIRED WITH TERMINAL BLOCK POWER CONNECTIONS AND EQUIPPED WITH A
LOCKABLE EXTERNAL OPERATOR HANDLE TO DISCONNECT THE CHILLER FROM MAIN

BRAZE PLATE EVAPORATOR TO BE MADE OF STAINLESS STEEL WITH COPPER AS THE BRAZE MATERIAL, DESIGNED TO WITHSTAND A REFRIGERANT SIDE WORKING PRESSURE OF 430 PSIG AND A WATERSIDE WORKING PRESSURE OF 150 PSIG. AIR-COOLED CONDENSER COILS TO HAVE LANCED ALUMINUM FINS MECHANICALLY

BONDED TO INTERNALLY-FINNED COPPER TUBING.
THE CONDENSER COIL TO BE AN INTEGRAL SUBCOOLING CIRCUIT. THE MAXIMUM ALLOWABLE WORKING PRESSURE OF THE CONDENSER IS 650 PSIG.
ELECTRICAL TRADES WILL PROVIDE THREE PHASE POWER FOR MOTORS AND 120V POWER FOR HEATERS.

GLOBE VALVES

FACTORY FABRICATED, OF TYPE, BODY MATERIAL, AND PRESSURE CLASS BASED ON MAXIMUM PRESSURE AND TEMPERATURE RATING OF PIPING SYSTEM, UNLESS OTHERWISE INDICATED.

FLUID CONTROL VALVES SHALL BE SINGLE SEATED, STRAIGHT THROUGH, GLOBE WITH RENEWABLE HARDENED SEATS AND HIGH LIFT CONTOURED STAINLESS STEEL PLUGS AND SEATS, ALLOWING TIGHT SHUTOFF. VALVES SHALL HAVE MODIFIED LINEAR CONTROL CHARACTERISTIC FOR STEAM VALVE SERVICE, AND EQUAL PERCENTAGE CHARACTERISTIC FOR WATER SERVICE. VALVES 2 INCHES AND SMALLER SHALL HAVE THREADED BRONZE BODIES, AND VALVES 2-1/2 INCHES AND LARGER IN SIZE SHALL HAVE FLANGED CAST IRON BODIES. STEM PACKING SHALL BE SPRING LOADED, SELF ADJUSTING TEFLON CONES. VALVE OPERATORS SHALL BE ROLLING NEOPRENE DIAPHRAGM STYLE, EITHER NORMALLY OPEN OR NORMALLY CLOSED AS REQUIRED. ELECTRONIC VALVE OPERATORS WILL BE ALLOWED WITH PRIOR OWNER APPROVAL. VALVES SHALL HAVE METAL ACTUATORS RATHER THAN PLASTIC, AND COPPER TUBING PNEUMATIC CONNECTIONS.

HYDRONIC SYSTEM GLOBE VALVES SHALL HAVE THE FOLLOWING CHARACTERISTICS: NPS 2 AND SMALLER: SINGLE SEATED, STRAIGHT THROUGH, CLASS 125 THREADED BRONZE BODY.

NDS 2 1/2 AND LABOUR. SINGLE SEATED, STRAIGHT THROUGH, CLOBE, CLASS 125

NPS 2-1/2 AND LARGER: SINGLE SEATED, STRAIGHT THROUGH, GLOBE, CLASS 125 FLANGED BRONZE BODY.
INTERNAL CONSTRUCTION: RENEWABLE HARDENED SEATS AND HIGH LIFT

CONTOURED STAINLESS STEEL PLUGS
AND SEATS ALLOWING TIGHT SHUTOFF, SPRING LOADED STEM PACKING WITH SELF
ADJUSTING TEFLON CONES.

FLOW CHARACTERISTICS: TWO-WAY VALVES SHALL HAVE EQUAL PERCENTAGE CHARACTERISTICS; THREE-WAY VALVES SHALL HAVE LINEAR CHARACTERISTICS.

SCALE: NO SCALE

CLOSE-OFF (DIFFERENTIAL) PRESSURE RATING: COMBINATION OF ACTUATOR AND TRIM SHALL PROVIDE MINIMUM CLOSE-OFF PRESSURE RATING OF 150 PERCENT OF TOTAL SYSTEM (PUMP) HEAD FOR TWO-WAY VALVES AND 100

PERCENT OF PRESSURE DIFFERENTIAL ACROSS VALVE OR 100 PERCENT OF TOTAL SYSTEM (PUMP) HEAD.

SYSTEM (PUMP) HEAD.
STEAM SYSTEM GLOBE VALVES SHALL HAVE THE FOLLOWING CHARACTERISTICS:
NPS 2 AND SMALLER: SINGLE SEATED, STRAIGHT THROUGH, CLASS 125 THREADED
BRONZE BODY.

NPS 2-1/2 AND LARGER: SINGLE SEATED, STRAIGHT THROUGH, GLOBE, CLASS 125 FLANGED BRONZE BODY.
INTERNAL CONSTRUCTION: RENEWABLE HARDENED SEATS AND HIGH LIFT

CONTOURED STAINLESS STEEL PLUGS
AND SEATS ALLOWING TIGHT SHUTOFF, SPRING LOADED STEM PACKING WITH SELF
ADJUSTING TEFLON CONES.
FLOW CHARACTERISTICS: MODIFIED LINEAR CHARACTERISTICS.

CLOSE-OFF (DIFFERENTIAL) PRESSURE RATING: COMBINATION OF ACTUATOR AND TRIM SHALL PROVIDE MINIMUM

CLOSE-OFF PRESSURE RATING OF 150 PERCENT OF OPERATING (INLET) PRESSURE

LIQUID-PRESSURE SWITCHES

LIQUID GAGE PRESSURE SWITCH, DIAPHRAGM OPERATED, LOW PRESSURE:
DESCRIPTION:
DIAPHRAGM OPERATED TO ACTUATE AN SPDT SNAP SWITCH.
ELECTRICAL CONNECTIONS: SCREW TERMINAL.
ENCLOSURE CONDUIT CONNECTION: KNOCK OUT OR THREADED CONNECTION.

USER INTERFACE: EXTERNAL SCREW WITH VISUAL SET-POINT ADJUSTMENT.

PROCESS CONNECTION: THREADED, NPS 1/4 (DN 10).
ENCLOSURE:
DRY INDOOR INSTALLATIONS: NEMA 250, TYPE 1.
OUTDOOR AND WET INDOOR INSTALLATIONS: NEMA 250, TYPE 4.

HAZARDOUS ENVIRONMENTS: EXPLOSION PROOF.
OPERATING DATA:

ELECTRICAL RATING: 15 A AT 120-V AC.
PRESSURE LIMITS:
RANGE 1 TO 30 PSIG (7 TO 207 KPA): 60 P

RANGE 1 TO 30 PSIG (7 TO 207 KPA): 60 PSIG (414 KPA).

RANGE 10 TO 125 PSIG (69 TO 862 KPA): 160 PSIG (1103 KPA).

TEMPERATURE LIMITS: MINUS 30 TO 150 DEG F (MINUS 35 TO 66 DEG C).

OPERATING RANGE: [1 TO 30 PSIG (7 TO 207 KPA)] [10 TO 250 PSIG (69 TO 862 KPA)].

DEADBAND: FIXED.

PRESSURE CHAMBER MATERIAL: [STEEL] [OR] [STAINLESS STEEL].
DIAPHRAGM MATERIAL: [NYLON] [OR] [PTFE].
LIQUID-PRESSURE DIFFERENTIAL SWITCH WITH SET-POINT INDICATOR:

DESCRIPTION: [BRASS] [OR] [TYPE 316 STAINLESS STEEL] DOUBLE OPPOSING BELLOWS OPERATE TO ACTUATE A SPDT SNAP SWITCH.

ELECTRICAL CONNECTIONS: SCREW TERMINAL.
ENCLOSURE CONDUIT CONNECTION: KNOCK OUT OR THREADED CONNECTION.
USER INTERFACE: THUMBSCREW SET-POINT ADJUSTMENT WITH ENCLOSED SET-POINT INDICATOR AND SCALE.
HIGH AND LOW PROCESS CONNECTIONS: THREADED, NPS 1/8 ((DN 3)).

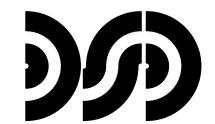
ENCLOSURE:
DRY INDOOR INSTALLATIONS: NEMA 250, TYPE 1.
OUTDOOR AND WET INDOOR INSTALLATIONS: NEMA 250, TYPE 4.

HAZARDOUS ENVIRONMENTS: EXPLOSION PROOF.
OPERATING DATA:
ELECTRICAL RATING: 15 A AT 120- TO 240-V AC.

PRESSURE LIMITS: AT LEAST 5 TIMES FULL-SCALE RANGE, BUT NOT LESS THAN SYSTEM DESIGN PRESSURE RATING.

TEMPERATURE LIMITS: MINUS 10 TO 180 DEG F (MINUS 23 TO 82 DEG C).

OPERATING RANGE: APPROXIMATELY 2 TIMES SET POINT.
DEADBAND: [ADJUSTABLE] [FIXED] [ADJUSTABLE OR FIXED AS REQUIRED BY APPLICATION].



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CITY OF ANN ARBOR

LARCOM CHILLER

REPLACEMENT PROJECT

ANN ARBOR, MI

PENTHOUSE FLOOR & ROOF NEW WORK

PLANS
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BIDS

03/20/19

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DRAWN: DMN

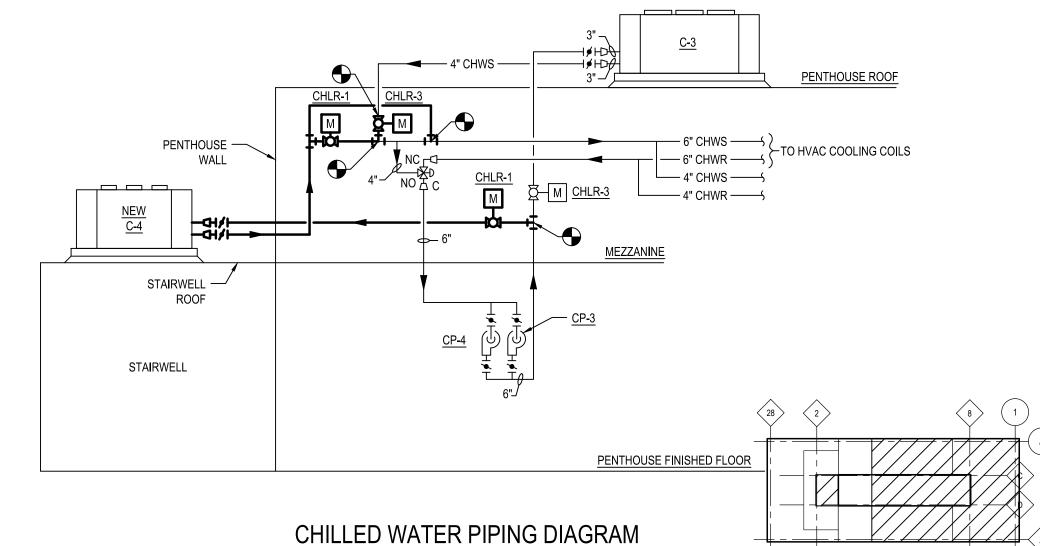
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CHECKED: DCM

ACADFILE: 18-1304-M-3

PROJECT No. 18-1304

M-3



		DDI	\	ITC			00	ADE 55	TC		
POINT NAME		RDWAF						ARE POIN			SHOW ON GRAPHIC
MAIN CHILLED WATER RETURN TEMP	Al	AO	BI	ВО	AV	BV	LOOP	SCHED	TREND	ALARM	X
MAIN CHILLED WATER RETURN TEMP MAIN CHILLED WATER SUPPLY TEMP	X								X		X
OUTSIDE AIR TEMP					Х						X
CHILLER 3 FAILURE										Х	X
CHILLER 4 FAILURE										Х	X
HIGH MAIN CHILLED WATER										Х	
RETURN TEMP HIGH MAIN CHILLED WATER											
SUPPLY TEMP										Х	
LEAD CHILLER FAILURE LOW MAIN CHILLED WATER RETURN TEMP										X	Х
LOW MAIN CHILLED WATER										Х	
SUPPLY TEMP CHILLED WATER										^	
DIFFERENTIAL PRESSURE	Х								Х		X
CHILLED WATER FLOW	Х								Х		X
CHILLED WATER RETURN TEMP	Х								Х		X
CHILLED WATER SUPPLY TEMP	Х								Х		X
CHILLED WATER BYPASS VALVE		Х							Х		Х
CHILLED WATER PUMP 3 VFD SPEED		Х							Х		X
CHILLED WATER PUMP 4 VFD SPEED		Х							Х		Х
CHILLED WATER ISOLATION VALVE STATUS			Х						Х		Χ
CHILLED WATER PUMP 3 STATUS			Х						Х		X
CHILLED WATER PUMP 3 VFD FAULT			Х							Х	X
CHILLED WATER PUMP 4 STATUS			Х						Х		X
CHILLED WATER PUMP 4 VFD FAULT			Х							Х	X
CHILLER STATUS			Х						Х		Х
EMERGENCY SHUTDOWN			Х						Х	Х	Х
CHILLED WATER ISOLATION VALVE				Х							Х
CHILLED WATER PUMP 3 START/STOP				Х					Х		Х
CHILLED WATER PUMP 4 START/STOP				Х					Х		Х
CHILLER 3 ENABLE				Х							Х
CHILLER 4 ENABLE				Х							Х
CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT					Х				Х		Х
CHILLED WATER FLOW SETPOINT					Х				Х		X
OUTSIDE AIR TEMP					Х						X
OUTSIDE AIR TEMP					Х						X
CHILLED WATER VALVE 1 FAILURE										Х	
CHILLED WATER VALVE 1 IN HAND										Х	
CHILLED WATER VALVE 1										Х	
RUNTIME EXCEEDED CHILLED WATER VALVE 2 FAILURE											
										X	
CHILLED WATER VALVE 2 IN HAND CHILLED WATER VALVE 2										Х	
RUNTIME EXCEEDED										Х	
CHILLED WATER VALVE 3 FAILURE										Х	
CHILLED WATER VALVE 3 IN HAND										Х	
CHILLED WATER VALVE 3 RUNTIME EXCEEDED										Х	
CHILLED WATER VALVE 4 FAILURE										Х	
CHILLED WATER VALVE 4 IN HAND										Х	
CHILLED WATER VALVE 4										Х	
RUNTIME EXCEEDED											
CHILLED WATER PUMP 3 FAILURE										X	
CHILLED WATER PUMP 3 IN HAND CHILLED WATER PUMP 3										Х	
RUNTIME EXCEEDED										Х	
CHILLED WATER PUMP 4 FAILURE										Х	
CHILLED WATER PUMP 4 IN HAND										Х	
CHILLED WATER PUMP 4 RUNTIME EXCEEDED										Х	
CHILLER FAILURE										Х	
CHILLER RUNNING IN HAND										Х	
CHILLER RUNTIME EXCEEDED										Х	
HIGH CHILLED WATER										Х	
DIFFERENTIAL PRESSURE											
HIGH CHILLED WATER SUPPLY TEMP LOW CHILLED WATER										Х	
DIFFERENTIAL PRESSURE										Х	_
LOW CHILLED WATER FLOW										Х	
				l	l	l				Х	
LOW CHILLED WATER SUPPLY TEMP											

CHW CONTROL SEQUENCE:

CHILLER LEAD/STANDBY OPERATION:

1. CHILLER MANAGER (TYPICAL OF 1) CHILLED WATER SYSTEM - CHILLER MANAGER - RUN CONDITIONS THE CHILLED WATER SYSTEM WILL BE ENABLED TO RUN WHENEVER THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJ.). TO PREVENT SHORT CYCLING, THE CHILLER MANAGER WILL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE). EACH CHILLER WILL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND

SUPPORT EQUIPMENT), WILL OPERATE IN A LEAD/STANDBY FASHION. CHILLER TRAIN WILL BE REFERRED TO AS CHILLER IN THIS SEQUENCE. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS WILL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS. TO PREVENT SHORT CYCLING, THERE WILL BE A USER DEFINABLE DELAY (ADJ.) BETWEEN STAGING UP OR DOWN, UNLESS SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS, THE LEAD CHILLER WILL RUN FIRST (CHILLER-3), ON FAILURE OF THE LEAD CHILLER, THE STANDBY CHILLER (CHILLER-4) WILL RUN AND THE LEAD CHILLER WILL TURN OFF. ON INCREASING MAIN CHILLED WATER SUPPLY TEMPERATURE ABOVE 52°F (ADJ.), THE LAG CHILLER SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD CHILLER TO MAINTAIN CHILLED WATER TEMPERATURE SETPOINT.

THE TWO CHILLER TRAINS, (EACH CHILLER AND ITS ASSOCIATED

ALARMS WILL BE PROVIDED AS FOLLOWS:

CHILLER-3 FAILURE: COMMANDED ON, BUT THE STATUS IS

CHILLER-4 FAILURE: COMMANDED ON, BUT THE STATUS IS LEAD CHILLER FAILURE: THE LEAD CHILLER IS IN FAILURE AND THE STANDBY CHILLER IS ON.

HIGH MAIN CHILLED WATER SUPPLY TEMP: IF THE MAIN CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAT 56°F (ADJ.). LOW MIN CHILLED WATER SUPPLY TEMP: IF THE MAIN

CHILLED WATER SUPPLY TEMPERATURE IS LESS THAT 38°f HIGH MAIN CHILLED WATER RETURN TEMP: IF THE MAIN CHILLED WATER RETURN TEMPERATURE IS GREATER THAT

68°F (ADJ.) LOW MAIN CHILLED WATER RETURN TEMP: IF THE MAIN CHILLED WATER RETURN TEMPERATURE IS LESS THAN 47°F (ADJ.)

ALARMS WILL BE PROVIDED AS FOLLOWS:

CHILLED WATER PUMP-3 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS

RUNTIME EXCEEDED: STATUES RUNTIME EXCEEDS A USER DEFINABLE LIMIT. VFD FAULT.

CHILLED WATER PUMP-4 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

VFD FAULT. CHILLED WATER FLOW CONTROL:

THE CONTROLLER WILL CHANGE CHILLED WATER PUMP SPEEDS AS CHILLER-3 OR 4 IS ENABLED BASED ON BALANCE NUMBERS. THE VFDS MINIMUM SPEED WILL NOT DROP BELOW 20% (ADJ.).

AIR COOLED CHILLER (TYPICAL OF 2)

CHILLER - RUN CONDITIONS:

OUTSIDE AIR TEMPERATURE IS GREATER THAN 56°F (ADJ.).

TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.

THE CHILLER SHALL BE ENABLED TO RUN WHENEVER THE

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

EMERGENCY SHUTDOWN: THE CHILLER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL STATUS.

CHILLED WATER ISOLATION VALVE: THE VALVE SHALL OPEN ANYTIME THE CHILLER IS CALLED TO RUN. THE VALVE SHALL ALSO OPEN WHENEVER THE CHILLED

WATER PUMP RUNS FOR FREEZE PROTECTION. THE VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED. THE

VALVE SHALL THEREFORE HAVE: A USER ADJUSTABLE DELAY ON START. AND A USER ADJUSTABLE DELAY ON STOP.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

CP-3

CHILLER-4

66-00-I1 CHILLER 4 STATUS

66-00-DO-1 CHILLER 4 S/S

ALARMS SHALL BE PROVIDED AS FOLLOWS: FAILURE: VALVE COMMANDED OPEN BUT THE STATUS

INDICATES CLOSED. OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.

SET AT 42°F

66-00-I3 CH-3 Supply (T-1)

66-00-I2 CH-1 Supply (T-2)

 RUNTIME EXCEEDED: VALVE STATUS RUNTIME EXCEEDS A USER-DEFINABLE LIMIT.

CHILLED WATER PUMP LEAD/STANDBY OPERATION: THE TWO CHILLED WATER PUMPS SHALL RUN ANYTIME THE CHILLER IS CALLED TO RUN. THE CHILLED WATER PUMP SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN A USER DEFINABLE SETPOINT

THE LEAD PUMP SHALL START PRIOR TO THE CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED. THE PUMP(S) SHALL THEREFORE HAVE: A USER ADJUSTABLE DELAY ON START. AND A USER ADJUSTABLE DELAY ON STOP.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

THE TWO PUMPS SHALL OPERATE IN A LEAD/STANDBY FASHION. THE LEAD PUMP SHALL RUN FIRST. ON FAILURE OF THE LEAD PUMP, THE STANDBY PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.

THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE): MANUALLY THROUGH A SOFTWARE SWITCH IF PUMP RUNTIME (ADJ.) IS EXCEEDED DAILY WEEKLY

ALARMS SHALL BE PROVIDED AS FOLLOWS:

MONTHLY

CHILLED WATER PUMP 1 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS

RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT. VFD FAULT.

CHILLED WATER PUMP 2 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS

RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT. VFD FAULT.

CHILLED WATER DIFFERENTIAL PRESSURE CONTROL: THE CONTROLLER SHALL MEASURE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE LEAD CHILLED WATER PUMP VFD TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE CHILLED WATER PUMP

SWITCH

CHWS

CHWR

SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW 10% (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS: HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.

LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

CHILLED WATER BYPASS VALVE - MINIMUM FLOW CONTROL: THE CONTROLLER SHALL MEASURE CHILLED WATER FLOW THROUGH THE CHILLER AND, AS THE CHILLED WATER FLOW DROPS BELOW SETPOINT, THE CONTROLLER SHALL MODULATE THE CHILLED WATER BYPASS VALVE OPEN TO MAINTAIN THE MINIMUM CHILLED WATER FLOW SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS: LOW CHILLED WATER FLOW: IF THE CHILLED WATER FLOW IS 25% (ADJ.) LESS THAN SETPOINT.

THE CHILLER SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.

THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

ALARMS SHALL BE PROVIDED AS FOLLOWS: CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS

CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. CHILLER RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

CHILLER CHILLED WATER SUPPLY SETPOINT: THE CHILLER SHALL MAINTAIN A CHILLED WATER SUPPLY TEMPERATURE SETPOINT AS DETERMINED BY ITS OWN INTERNAL CONTROLS (PROVIDED BY OTHERS).

CHILLED WATER TEMPERATURE MONITORING: THE FOLLOWING TEMPERATURES SHALL BE MONITORED: CHILLED WATER SUPPLY. CHILLED WATER RETURN.

ALARMS SHALL BE PROVIDED AS FOLLOWS: HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F

CHILLER-3

CHWS

CP-3

VFD

65-00-IN1 CP-4 Status

65-00-DO-4 CP-4 ST/SP

66-00-AO-3 CP-4 SPEED

CH-3 INTEGRATION BACNET/MSTP

65-00-I31 CP-3 Status

VFD

65-00-DO-3 CP-3 ST/SP 66-00-AO-2 CP-3 SPEED LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.)

DiClemente

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Engineering and Architecture

CITY OF ANN ARBOR REPLACEMENT PROJECT ANN ARBOR, MI



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ISSUED FOR	DATE
FINAL OWNER REVIEW	02/08/19
BIDS	02/08/19 03/20/19

PROJECT No.	18-1304
ACADFILE:	18-1304-M-4
CHECKED:	DCM
PM / PIC:	JSR/BJR
DRAWN:	DMN
DESIGNER:	MJB

M-4

CHW SYSTEM SCALE: NO SCALE

<u> </u>	 IW (CON	TRC)I F	 2017		SCH	FDIII	F		
 	1										
POINT NAME	Al	ARDWAR	RE POIN	ITS BO	AV	BV	LOOP	ARE POIN	TS TREND	ALARM	SHOW ON GRAPHIC
BOILER 1 HOT WATER RETURN TEMP	X	ΑΟ	b'	_ BO	^ '	5,	2001	JOHED	X	ALAINI	Х
BOILER 1 HOT WATER SUPPLY TEMP	Х								Х		Х
BOILER 2 HOT WATER RETURN TEMP	Х				Х				Х		Х
BOILER 2 HOT WATER SUPPLY TEMP	X								X		X
BOILER 3 HOT WATER RETURN TEMP BOILER 3 HOT WATER SUPPLY TEMP	X								X		X
HOT WATER DIFFERENTIAL PRESSURE	X								X		X
PRIMARY HOT WATER RETURN TEMP	Х								х		Х
PRIMARY HOT WATER SUPPLY TEMP	Х								Х		Х
HOT WATER PUMP 1 VFD SPEED		X							X		X
HOT WATER PUMP 2 VFD SPEED HOT WATER PUMP 3 VFD SPEED		X							X		X
HOT WATER PUMP 4 VFD SPEED		X							X		X
BOILER 1 ALARM STATUS			х						х		Х
BOILER 1 LOW WATER LEVEL			Х						Х	Х	Х
BOILER 1 STATUS			X						X		X
BOILER 2 ALARM STATUS BOILER 2 LOW WATER LEVEL			X						X	Х	X
BOILER 2 STATUS			X						X		X
BOILER 3 ALARM STATUS			х						Х		X
BOILER 3 LOW WATER LEVEL			х						Х	Х	Х
BOILER 3 STATUS			Х						Х		X
HOT WATER PUMP 1 STATUS	<u> </u>		X						Х	V	X
HOT WATER PUMP 1 VFD FAULT HOT WATER PUMP 2 STATUS			X						Х	X	X X
HOT WATER PUMP 2 VFD FAULT			χ							Х	X
HOT WATER PUMP 3 STATUS			Х						Х		X
HOT WATER PUMP 3 VFD FAULT			Х							Х	Х
HOT WATER PUMP 4 STATUS			Х						Х		Х
HOT WATER PUMP 4 VFD FAULT			Х	V						Х	X
BOILER 1 ENABLE BOILER 2 ENABLE				X							X
BOILER 3 ENABLE				X							X
HOT WATER PUMP 1 START/STOP				х							Х
HOT WATER PUMP 2 START/STOP				Х							Х
HOT WATER PUMP 3 START/STOP				Х							Х
HOT WATER PUMP 4 START/STOP HOT WATER DIFFERENTIAL	_			X							X
PRESSURE SETPOINT	<u> </u>				X				X		X
OUTSIDE AIR TEMP BOILER 1 FAILURE					X					Х	
BOILER 1 HIGH HOT WATER										х Х	
SUPPLY TEMP BOILER 1 LOW HOT WATER											
SUPPLY TEMP										X	
BOILER 1 RUNNING IN HAND BOILER 1 RUNTIME EXCEEDED										X	
BOILER 2 FAILURE										X	
BOILER 2 HIGH HOT WATER										х	
SUPPLY TEMP BOILER 2 LOW HOT WATER										Х	
SUPPLY TEMP BOILER 2 RUNNING IN HAND										х Х	
BOILER 2 RUNTIME EXCEEDED										X	
BOILER 3 FAILURE										X	
BOILER 3 HIGH HOT WATER SUPPLY TEMP										Х	
BOILER 3 LOW HOT WATER SUPPLY TEMP										Х	
BOILER 3 RUNNING IN HAND										Х	
BOILER 3 RUNTIME EXCEEDED										Х	
HIGH HOT WATER DIFFERENTIAL PRESSURE										Х	
HIGH PRIMARY HOT WATER SUPPLY TEMP										Х	
HOT WATER PUMP 1 FAILURE										X	
HOT WATER PUMP 1 RUNNING IN HAND										Х	
HOT WATER PUMP 1 RUNTIME EXCEEDED)									Х	
HOT WATER PUMP 2 FAILURE										X	
HOT WATER PUMP 2 RUNNING IN HAND HOT WATER PUMP 2 RUNTIME EXCEEDED	<u> </u>									X	
HOT WATER PUMP 3 FAILURE										X	
HOT WATER PUMP 3 RUNNING IN HAND										X	
HOT WATER PUMP 3 RUNTIME EXCEEDED										Х	
HOT WATER PUMP 4 FAILURE										X	
HOT WATER PUMP 4 RUNNING IN HAND										X	
HOT WATER PUMP 4 RUNTIME EXCEEDED LEAD BOILER FAILURE										X	
LOW HOT WATER										X	
DIFFERENTIAL PRESSURE LOW PRIMARY HOT WATER											
SUPPLY TEMP	9	A	17	7	<u> </u>		0		דני	X 30	70
TOTALS		L HAR	17 DWARE		2	0	TOTAL SO	0 Oftware	27 (62)	39	38
<u> </u>		- 11111	111	()	<u> </u>				·/		

HW CONTROL SEQUENCE:

1. THREE BOILER SYSTEM (TYPICAL OF 1)
BOILER SYSTEM — RUN CONDITIONS:
THE BOILER SYSTEM SHALL BE ENABLED TO RUN WHENEVER
OUTSIDE AIR TEMPERATURE IS LESS THAN 65'F (ADJ.).
TO PREVENT CYCLYING, EACH BOILER SHALL RUN FOR AND BE
OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER
DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR
CONDITIONS.

EACH BOILER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS. THE BOILER SYSTEM SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN 38°F (ADJ.).

BOILER 1 SAFETIES:
THE FOLLOWING SAFETIES SHALL BE MONITORED:
BOILER ALARM

LOW WATER LEVEL ALARMS SHALL BE PROVIDED AS FOLLOWS: BOILER ALARM LOW WATER LEVEL ALARM

BOILER 2 SAFETIES:
THE FOLLOWING SAFETIES SHALL BE MONITORED
BOILER ALARM
LOW WATER LEVEL
ALARMS SHALL BE PROVIDED AS FOLLOWS:
BOILER ALARM

BOILER 3 SAFETIES:
THE FOLLOWING SAFETIES SHALL BE MONITORED
BOILER ALARM
LOW WATER LEVEL
ALARMS SHALL BE PROVIDED AS FOLLOWS:
BOILER ALARM
LOW WATER LEVEL ALARM

LOW WATER LEVEL ALARM

HOT WATER PUMP LEAD/LAG OPERATION:
THW TWO SETS OF HOT WATER PUMPS (PUMP 1&2 AND PUMP 3&4) SHALL OPERATE IN A LEAD STANDBY FASHION. ONE SET OF PUMPS SHALL ROTATE AS LEAD ON A USER SCHEDULE. WHEN THE LEAD SET OF PUMPS FAILS THE STANDBY SET

WHEN THE LEAD SET OF PUMPS FAILS THE STANDBY SET SHALL BECOME THE LEAD.
THE TWO HOT WATER PUMPS IS A SET SHALL OPERATE IN A LEAD/LAG FASHION.

THE LEAD PUMP SHALL RUN FIRST.
ON FAILURE OF THE LEAD PUMP, THE LAG PUMP
SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.
ON DECREASING HOT WATER DIFFERENTIAL PRESSURE,
THE LAG PUMP SHALL STAGE ON AND RUN IN UNISON
WITH THE LEAD PUMP TO MAINTAIN HOT WATER
DIFFERENTIAL PRESSURE SETPOINT.

THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLOWING CONDITIONS (USER SELECTABLE):

MANUALLY THROUGH A SOFTWARE SWITCH

IF PUMP RUNTIME (ADJ.) IS EXCEEDED

DAILY

WEEKLY

MONTHLY
ALARMS SHALL BE PROVIDED AS FOLLOWS:
HOT WATER PUMP 1

VFD FAULT.

VFD FAULT.

FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER
DEFINABLE LIMIT.

HOT WATER PUMP 2
FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER
DEFINABLE LIMIT.

HOT WATER PUMP 3
FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER
DEFINABLE LIMIT.
VFD FAULT.

HOT WATER PUMP 4
FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER

DEFINABLE LIMIT.

VFD FAULT.

HOT WATER DIFFERENTIAL PRESSURE CONTROL:
THE CONTROLLER SHALL MEASURE HOT WATER DIFFERENTIAL
PRESSURE AND MODULATE THE HOT WATER PUMP VFDS IN
SEQUENCE TO MAINTAIN ITS HOT WATER DIFFERENTIAL
PRESSURE SETPOINT.
THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL
SETPOINTS SHALL BE FIELD ADJUSTED DURING THE

COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE HOT WATER PUMP SPEEDS TO MAINTAIN A HOT WATER DIFFERENTIAL PRESSURE OF 12 LBF/IN2 (ADJ.). THE VFDS MINIMUM SPEED SHALL NOT DROP

BELOW 20% (ADJ.).
ON DROPPING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS
SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT AS
FOLLOWS:

THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT.

IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON.

THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

ON RISING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS

SHALL STAGE OFF AS FOLLOWS:

IF THE VFDS SPEEDS DROPS BACK TO 60% (ADJ.)

BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF.

THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN

SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
HIGH HOT WATER DIFFERENTIAL PRESSURE: IF 25%
(ADJ.) GREATER THAN SETPOINT.
LOW HOT WATER DIFFERENTIAL PRESSURE: IF 25%
(ADJ.) LESS THAN SETPOINT.

BOILER LEAD/LAG/STANDBY OPERATION:
THE THREE BOILER SHALL OPERATE IN A LEAD/LAG/STANDBY FASHION.

THE LEAD BOILER SHALL RUN FIRST.
ON FAILURE OF THE LEAD BOILER, THE LAG BOILER
SHALL RUN AND THE LEAD BOILER SHALL TURN OFF.
AS HOT WATER TEMPERATURE DROPS BELOW A
SETPOINT OF 150°F (ADJ.), THE LAG BOILER SHALL
STAGE ON AND RUN IN UNISON WITH THE LEAD BOILER
TO MAINTAIN HOT WATER TEMPERATURE SETPOINT.
AS HOT WATER TEMPERATURE RISES BACK TO 20°F
ABOVE SETPOINT, THE LAG BOILER SHALL STAGE OFF.
THE DESIGNATED LEAD BOILER SHALL ROTATE UPON ONE OF

THE DESIGNATED LEAD BOILER SHALL ROTATE UPO
THE FOLLOWING CONDITIONS (USER SELECTABLE):
MANUALLY THROUGH A SOFTWARE SWITCH
IF BOILER RUNTIME (ADJ.) IS EXCEEDED
DAILY
WEEKLY

MONTHLY
ALARMS SHALL BE PROVIDED AS FOLLOWS:

BOILER 1:

FAILURE: COMMANDED ON, BUT STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER
DEFINABLE LIMIT.

FAILURE: COMMANDED ON, BUT STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER
DEFINABLE LIMIT.

BOILER 3:

FAILURE: COMMANDED ON, BUT STATUS IS OFF.
RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS
IS ON.
RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER
DEFINABLE LIMIT.

LEAD BOILER FAILURE: THE LEAD BOILER IS IN FAILURE AND
THE STANDBY BOILER IS ON.

HOT WATER SUPPLY TEMPERATURE SETPOINT:
THE BOILER SHALL MAINTAIN A HOT WATER SUPPLY
TEMPERATURE SETPOINT AS DETERMINED BY ITS OWN
INTERNAL CONTROLS (PROVIDED BY OTHERS).
PRIMARY HOT WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
PRIMARY HOT WATER SUPPLY
PRIMARY HOT WATER RETURN

PRIMARY HOT WATER RETURN
ALARMS SHALL BE PROVIDED AS FOLLOWS:
HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER
THAN 200'F (ADJ.).
LOW PRIMATY HOT WATER SUPPLY TEMP: IF LESS THAN

100°F (ADJ.).

BOILER 1 HOT WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
BOILER 1 HOT WATER SUPPLY

BOILER 1 HOT WATER RETURN

ALARMS SHALL BE PROVIDED AS FOLLOWS:

HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER

THAN 200°F (ADJ.).

LOW PRIMATY HOT WATER SUPPLY TEMP: IF LESS THAN

100°F (ADJ.).

BOILER 2 HOT WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
BOILER 1 HOT WATER SUPPLY
BOILER 1 HOT WATER RETURN
ALARMS SHALL BE PROVIDED AS FOLLOWS:

HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).
LOW PRIMATY HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).
BOILER 3 HOT WATER TEMPERATURE MONITORING:

THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
BOILER 1 HOT WATER SUPPLY
BOILER 1 HOT WATER RETURN
ALARMS SHALL BE PROVIDED AS FOLLOWS:
HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER
THAN 200°F (ADJ.).
LOW PRIMATY HOT WATER SUPPLY TEMP: IF LESS THAN

100°F (ADJ.).

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CITY OF ANN ARBOR
LARCOM CHILLER
REPLACEMENT PROJECT
ANN ARBOR, MI

HW CONTROL SEQUENCE

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ISSUED FOR	DATE
FINAL OWNER REVIEW	02/08/19 03/20/19
BIDS	03/20/19

DESIGNER: MJB

DRAWN: DMN

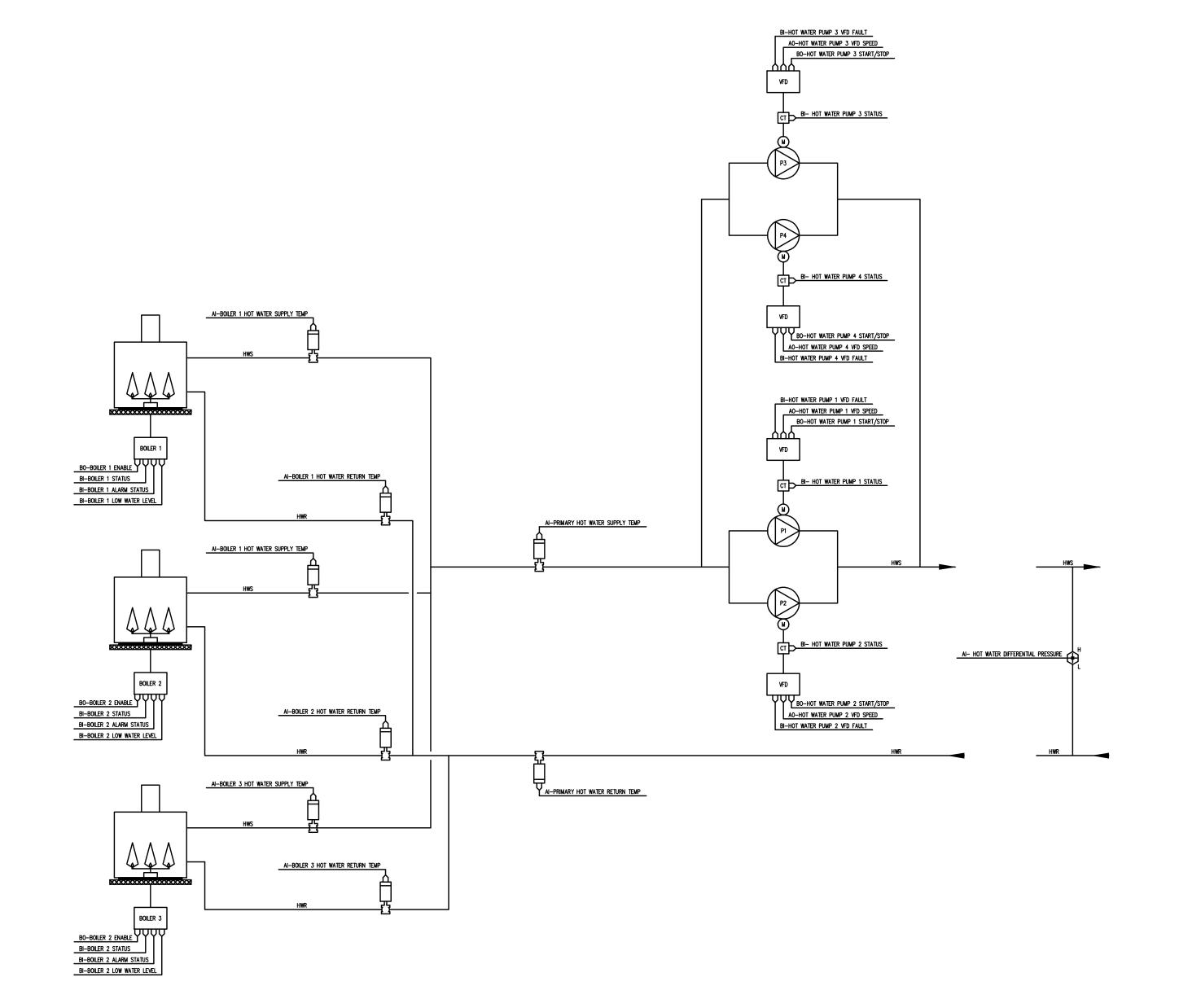
PM / PIC: JSR/BJR

CHECKED: DCM

ACADFILE: 18-1304-M-5

PROJECT No. 18-1304

M-5



HW SYSTEM

SCALE: NO SCALE

	ARCHITECTURA	L - M	ECHA	ANICA	AL - EL	ECTR	ICAL C	COORE	ITANIC	ON SC	CHEDULE
MARK	LOCATION	HP	KW	MCA	ELECT	RICAL	DISCO	NNECT	STAF	RTER	REMARKS
IVIAIXIX	LOCATION	TIF	rvv	MOA	VOLTAGE	PHASE	FURN.	INST.	FURN.	INST.	KLIWAKKO
C-4	ENCLOSED ROOF	-	76	147.8A	460	3	E	E	S	S	-
C-4 FREEZE PROTECTION HEATER	ENCLOSED ROOF	-	-	15A	120	1	E	Е	S	S	SEPARATE CIRCUIT CONNECTION FOR FREEZE PROTECTION HEATER TO NEW C-4 CHILLER
					LEGEND						

=	SUPPLIER (MANUFACTURER)*	С	=	CHILLER
=	MECHANICAL	CP	=	CHILLED WATER PUMP
=	ELECTRICAL			

* - ITEMS INDICATED AS SUPPLIER SHALL BE PROVIDED WITH THE ITEM/ EQUIPMENT OR BY THE CONTRACTOR PURCHASING THE ITEM/EQUIPMENT

ELECTRICAL SPECIFICATION

THE CURRENT EDITION OF THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, A.I.A. DOC. A201. AND THE SUPPLEMENTARY GENERAL CONDITIONS ARE A PART OF THE CONTRACT FOR THIS WORK. CONTRACTOR SHALL CONSULT THEM AND THE GENERAL REQUIREMENTS, DIV. 1, FOR INSTRUCTIONS PERTAINING TO WORK UNDER THIS SECTION.

VFD = VARIABLE FREQUENCY DRIVE

WORK INCLUDED

THE CONTRACTOR SHALL PROVIDE ALL ITEMS, ARTICLES, MATERIALS, OPERATIONS, OR METHODS MENTIONED, LISTED OR SCHEDULED ON THE DRAWINGS AND IN THESE SPECIFICATIONS, INCLUDING ALL LABOR, MATERIALS, EQUIPMENT, AND ALL INCIDENTALS NECESSARY REQUIRED FOR THE COMPLETION AND OPERATION OF ALL SYSTEMS.

THE INSTALLATION SHALL BE MADE SO THAT ALL COMPONENT PARTS FUNCTION TOGETHER AS A WORKABLE SYSTEM; IT SHALL BE COMPLETE WITH ALL ACCESSORIES NECESSARY FOR PROPER OPERATION. WHEN THE INSTALLATION IS COMPLETE, ALL EQUIPMENT SHALL BE OPERATIVE AND IN PROPER ADJUSTMENT. ALL WORK SHALL BE EXECUTED IN CONFORMITY WITH THE BEST PRACTICE SO AS TO CONTRIBUTE TO EFFICIENCY OF OPERATION, MINIMUM MAINTENANCE, ACCESSIBILITY AND SIGHTLINESS.

TO ACCOMPLISH THESE RESULTS, THE CONTRACTOR SHALL CONSULT THE ARCHITECTS AND ENGINEER'S PLANS COVERING THE VARIOUS OTHER TRADES, THE FIELD LAYOUTS OF THE CONTRACTORS FOR THESE TRADES AND THEIR SHOP DRAWINGS. HE SHALL COORDINATE HIS WORK ACCORDINGLY.

LOCAL CONDITIONS

THE CONTRACTOR SHALL VISIT THE SITE AND SHALL FAMILIARIZE HIMSELF WITH CONDITIONS WHICH WILL AFFECT THE WORK HE IS TO PERFORM. THE SUBMISSION OF A PROPOSAL BY THIS CONTRACTOR SHALL BE CONCLUSIVE EVIDENCE THAT THIS CONTRACTOR HAS VISITED THE SITE AND HAS GIVEN PROPER CONSIDERATION AND EVALUATION OF THESE CONDITIONS IN THE PREPARATION OF HIS PROPOSAL. NO ALLOWANCE SHALL SUBSEQUENTLY BE MADE IN HIS BEHALF FOR EXTRA EXPENSE INCURRED DUE TO FAILURE OR NEGLECT ON HIS PART TO MAKE THIS VISIT AND EXAMINATION.

WHERE ACTIVE GAS, ELECTRIC, OR OTHER SERVICES ARE ENCOUNTERED DURING THE PERFORMANCE OF THIS CONTRACT, THE CONTRACTOR SHALL PROTECT, BRACE AND SUPPORT THEM AS REQUIRED. DO NOT PREVENT, INTERRUPT OR DISTURB OPERATION OF EXISTING SERVICES THAT ARE TO REMAIN. RELOCATE EXISTING SERVICES IF REQUIRED.

PERMITS AND INSPECTIONS

THE CONTRACTOR SHALL TAKE OUT ALL PERMITS AND ARRANGE FOR ALL NECESSARY INSPECTIONS AND SHALL PAY ALL FEES AND EXPENSES IN CONNECTION THEREWITH AS A PART OF THEIR WORK UNDER THEIR CONTRACT.

UPON COMPLETION OF THE WORK, THEY SHALL FURNISH TO THE OWNER ALL CERTIFICATES OF INSPECTION AND APPROVAL WHICH ARE CUSTOMARY FOR THE CLASSES OF WORK INVOLVED.

RULES, CODES AND STANDARDS

ALL WORK SHALL BE PERFORMED OR INSTALLED IN STRICT ACCORDANCE WITH ALL APPLICABLE RULES, REGULATIONS AND CODES OF LOCAL, STATE AND FEDERAL GOVERN- MENTS, OR OTHER AUTHORITIES HAVING LAWFUL JURISDICTION, AND EACH CONTRACTOR AND SUBCONTRACTOR SHALL BE RESPONSIBLE FOR SUCH COMPLIANCE.

ALL ELECTRICAL WORK AND EQUIPMENT SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ISSUE OF THE NATIONAL ELECTRICAL CODE, AND SHALL BEAR THE LABEL OF LISTING WITH THE UNDERWRITERS'

ALL MATERIALS, PRODUCTS AND EQUIPMENT, INCLUDING COMPONENTS THEREOF, SHALL BE NEW.

ALL ELECTRICAL WORK SHALL BE INSTALLED TO BE READILY ACCESSIBLE FOR OPERATING, SERVICING, MAINTAINING AND REPAIRING.

ELECTRICAL DISTRIBUTION SYSTEM SHALL BE DESIGNED TO WITHSTAND AND SAFELY INTERRUPT AN AVAILABLE SHORT CIRCUIT CURRENT THAT THE CONTRACTOR HAS VERIFIED WITH THE LOCAL UTILITY COMPANY.

SHOP DRAWINGS

COMPLETE SHOP DRAWINGS FOR ALL ELECTRICAL MANUFACTURED ITEMS SHALL BE SUBMITTED TO THE ARCHITECT AND ENGINEER FOR APPROVAL BEFORE FABRICATION OF THE ITEMS. DRAWINGS SHALL INDICATE NAME OF PROJECT AND NAME OF CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL SUBMIT EQUIPMENT SHOP DRAWINGS TO THE ARCHITECT FOR APPROVAL BEFORE INSTALLATION OF ALL OF THE FOLLOWING ELECTRICAL EQUIPMENT:

A. WIRING DEVICES

THE CONTRACTOR SHALL THOROUGHLY CHECK ALL SHOP DRAWINGS AS REGARDS TO MEASUREMENTS, SIZES OF EQUIPMENT, MATERIALS AND DETAILS TO SATISFY HIMSELF THAT THEY CONFORM TO THE INTENT OF ENGINEER'S DRAWINGS AND SPECIFICATIONS. DRAWINGS FOUND TO BE INACCURATE OR OTHERWISE IN ERROR ARE TO BE RETURNED TO THE SUB- CONTRACTORS FOR CORRECTION BEFORE SUBMITTING SAME TO THE

THE CHECKING AND APPROVING OF SHOP DRAWINGS BY THE ENGINEER SHALL BE CONSTRUED AS ASSISTING THE CONTRACTOR AND THE ENGINEER'S ACTION DOES NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY FOR ERRORS OR OMISSIONS WHICH MAY EXIST THEREON. WHERE ERRORS OR OMISSIONS ARE DISCOVERED LATER, THEY MUST ACCORDINGLY BE MADE GOOD BY THE CONTRACTOR.

DRAWINGS NOT APPROVED MUST BE CORRECTED AND RETURNED FOR FINAL APPROVAL. NO SHOP DRAWINGS SHALL BE USED ON THE WORK UNLESS APPROVED BY THE ENGINEER. ONE COPY OF ALL DRAWINGS SUBMITTED WILL BE RETAINED BY THE ENGINEER. CONTRACTOR SHALL SUBMIT AS MANY MORE COPIES AS HE DESIRES TO BE RETURNED. THE CONTRACTOR SHALL FURNISH TO THE FIELD, PRINTS OF CHECKED AND APPROVED SHOP DRAWINGS AS REQUIRED BY THE CONSTRUCTION OPERATIONS.

AFTER SHOP DRAWINGS HAVE BEEN SUBMITTED TO THE ENGINEER AND RETURNED TO THE CONTRACTOR APPROVED, THE CONTRACTOR WILL NOT BE ALLOWED TO RESUBMIT SHOP DRAWINGS OF ANOTHER MANUFACTURER FOR THIS SAME ITEM WITHOUT THE ENGINEER'S CONSENT.

EXTRA WORK

FOR ANY EXTRA ELECTRICAL WORK WHICH MAY BE PROPOSED. THIS CONTRACTOR SHALL FURNISH TO THE GENERAL CONTRACTOR AN ITEMIZED BREAKDOWN OF THE ESTIMATED COST OF THE MATERIALS AND LABOR REQUIRED TO COMPLETE THIS WORK. THE CONTRACTOR SHALL PROCEED ONLY AFTER RECEIVING A WRITTEN ORDER FROM THE GENERAL CONTRACTOR ESTABLISHING THE AGREED PRICE AND DESCRIBING THE WORK TO BE DONE.

SCHEDULE OF WORK

THE CONTRACTOR SHALL EXPEDITE HIS WORK IN ORDER TO CONFORM TO THE DATES OUTLINED IN THE GENERAL CONTRACTOR'S PROGRESS SCHEDULE AND WHERE NECESSARY SHALL WORK OVERTIME AT HIS OWN

EXPENSE SO THAT ALL WORK MAY BE COMPLETED WITHIN THE TIME OUTLINED.

COORDINATE ALL WORK WITH THAT OF OTHER TRADES. PERFORM WORK IN A PHASED MANNER AS REQUIRED TO ACCOMMODATE THE PROJECT CONSTRUCTION SCHEDULE. COORDINATE ALL WORK AND THE SEQUENCE OF INSTALLATION WITH THE GENERAL CONTRACTOR.

NO CUTTING OR BURNING OF HOLES THROUGH BEAMS OR OTHER STRUCTURAL MEMBERS SHALL BE DONE

WITHOUT THE SPECIFIC PERMISSION OF THE ARCHITECT.

ALL MEASUREMENTS NECESSARY FOR THE PROPER INSTALLATION OF MATERIALS OR APPARATUS SHALL BE TAKEN IN THE FIELD. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR THE CORRECT FIT OF WORK INSTALLED.

ALL OPENINGS IN WALLS, ROOF, CEILINGS, OR FLOORS MADE BY THE CONTRACTOR SHALL BE NEATLY PATCHED.

ALL ELECTRICAL CIRCUITS SHALL BE TESTED AS SOON AS CONDUCTORS ARE INSTALLED, AND FINAL TESTS SHALL BE MADE IN THE PRESENCE OF THE ENGINEER, WHEN ALL WORK IS COMPLETE, IF REQUIRED. IF CIRCUITS ARE NOT PROPERLY CONTROLLED AND INSULATED, MAKE NECESSARY CHANGES AND REPAIRS.

AT COMPLETION, THE CONTRACTOR SHALL FURNISH TO THE OWNER ONE (1) COMPLETE SET OF CONTRACT MYLAR SEPIAS, NEATLY MARKED AND DIMENSIONED WHERE REQUIRED TO SHOW ALL VARIATIONS BETWEEN ACTUAL CONSTRUCTION AS BUILT AND WORK AS INDICATED ON THE PRINTED DRAWINGS, INCLUDING ALL CHANGES IN LOCATIONS, SIZES, ETC. EACH SHEET CERTIFIED AS BUILT BY THE CONTRACTOR, AND TURNED OVER TO THE OWNER IN GOOD CONDITION.

GUARANTEE AND WARRANTY

CONTRACTOR SHALL GUARANTEE ALL WORK INSTALLED BY HIM OR HIS SUBCONTRACTORS TO BE FREE FROM DEFECT IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FOLLOWING THE DATE OF FINAL ACCEPTANCE OF THE WORK, UNLESS A LONGER PERIOD IS STIPULATED UNDER SPECIFIC HEADINGS, AND HE SHALL REPAIR OR REPLACE AT NO ADDITIONAL COST TO THE OWNER, ANY MATERIAL OR EQUIPMENT DEVELOPING DEFECTS AND SHALL ALSO MAKE GOOD ANY DAMAGE CAUSED BY SUCH DEFECTS OR THE CORRECTION OF DEFECTS.

REPAIRS OR REPLACEMENTS SHALL BEAR ADDITIONAL TWELVE (12) MONTHS GUARANTEE, AS ORIGINALLY CALLED FOR, DATED FROM THE FINAL ACCEPTANCE OF THE REPAIR OR REPLACEMENT. THIS REQUIREMENT SHALL BE BINDING EVEN THOUGH IT WILL EXCEED PRODUCT GUARANTEES NORMALLY FURNISHED BY SOME

CONTRACTOR SHALL SUBMIT HIS OWN AND EACH EQUIPMENT MANUFACTURER'S WRITTEN CERTIFICATES. WARRANTING THAT EACH ITEM OF EQUIPMENT FURNISHED COMPLIES WITH ALL REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. NOTE THAT GUARANTEE SHALL RUN FROM DATE OF FINAL ACCEPTANCE OF THE WORK, NOT FROM DATE OF INSTALLATION OF A DEVICE OR PIECE OF EQUIPMENT.

ALL PANELS, DISCONNECT SWITCHES, ETC. SHALL HAVE THE NAME OF THE PANEL OR EQUIPMENT CONTROLLED ON FRONT COVER IN ONE INCH LETTERS ON ENGRAVED BAKELITE NAMEPLATE.

PAINT ALL IRON WORK AND OTHER MISCELLANEOUS IRON TWO COATS OF AN APPROVED OIL BASE PAINT. COLOR OF PAINT SHALL BE SELECTED SUCH THAT IT BLENDS WITH SURROUNDINGS.

RECEPTACLE PLATES SHALL BE .040 STAINLESS STEEL, 97,000 SERIES AS MANUFACTURED BY PASS AND SEYMOUR, HUBBELL, LEVITON, BRYANT, EAGLE OR ARROW- HART AND HEGEMAN. COLOR TO BE AS SELECTED BY ARCHITECT. PROVIDE TYPED TAG ON BACK OF EACH SWITCH AND RECEPTACLE PLATE, IDENTIFYING PANEL

ABSOLUTELY NO DESPARD SWITCHES SHALL BE USED UNLESS OTHERWISE SPECIFIED OR UNLESS NECESSARY DUE TO BUILDING CONSTRUCTION, AND THEN ONLY IF SPECIFICALLY APPROVED BY THE ARCHITECT.

WEATHERPROOF DUPLEX RECEPTACLES SHALL BE FLUSH WALL MOUNTED, 20 AMPERE, 125 VOLT, SPECIFICATION GRADE AS MANUFACTURED BY HUBBELL CATALOG NO. GF-5362 RECEPTACLE WITH GROUND FAULT PROTECTION (COLOR TO BE AS SELECTED BY ARCHITECT) AND INTERMATIC CATALOG NO. WP1030MC GRAY DIE CAST METAL MOUNTING BASE WITH GRAY DIE CAST METAL WEATHERPROOF HINGED COVER WITH OPENING FOR (2) CORDS, OR EQUAL AS MANUFACTURED BY PASS AND SEYMOUR, BRYANT, EAGLE OR ARROW-HART & HEGEMAN.

CONDUITS AND FITTINGS

CONDUIT IN MASONRY PARTITIONS, EXPOSED AND CONDUIT LARGER THAN 2" SHALL BE HOT- DIP GALVANIZED, RIGID HEAVYWALL TYPE, UNLESS OTHERWISE NOTED.

CONDUIT 2" AND SMALLER WHICH IS CONCEALED IN DRYWALL PARTITIONS, ABOVE ACCESSIBLE CEILINGS AND WHERE EXPOSED ABOVE 48" AFF, SHALL BE ELECTRICAL METALLIC TUBING.

CONDUIT SHALL BE DELIVERED TO THE SITE IN STANDARD 10 FOOT LENGTHS, EACH LENGTH BEARING THE UL LABEL. HOT-DIP GALVANIZED CONDUIT SHALL BE SO LABELED.

MINIMUM SIZE OF CONDUIT SHALL BE 1/2", UNLESS OTHERWISE NOTED.

ALL CONDUIT SHALL BE SECURELY FASTENED IN PLACE WITH APPROVED CLAMPS AND CAREFULLY REAMED BEFORE INSTALLING.

CONDUITS SHALL NOT BE INSTALLED WITHIN 3" OF HOT WATER LINES.

CONDUITS IN MECHANICAL EQUIPMENT SPACES AND UNFINISHED AREAS MAY BE RUN EXPOSED. ALL OTHER CONDUIT SHALL BE CONCEALED, UNLESS OTHERWISE NOTED. EXPOSED CONDUIT SHALL BE INSTALLED PARALLEL, OR AT RIGHT ANGLES TO ADJACENT BUILDING LINES AND SHALL BE SUPPORTED AT INTERVALS NOT EXCEEDING EIGHT FEET.

GROUPS OF CONDUITS, WHERE SUSPENDED, SHALL BE SUPPORTED ON TRAPEZE TYPE HANGERS, USING 3/8" ROD AND CHANNEL IRON OR UNISTRUT. INDIVIDUAL CONDUITS NOT SUPPORTED ON PIPE STRAPS SHALL BE PROVIDED WITH CONDUIT CLAMPS OR RING HANGERS SUSPENDED ON RODS. PERFORATED IRON STRAPS OR SOFT IRON WIRE FOR PIPE SUPPORTS SHALL NOT BE USED.

NO BEAMS OR OTHER STRUCTURAL MEMBERS SHALL BE DRILLED, BURNED, OR CUT WITHOUT WRITTEN APPROVAL OF THE ARCHITECT.

CONNECTORS AND COUPLINGS FOR ELECTRICAL METALLIC TUBING SHALL BE OF THE SET- SCREW TYPE AS MANUFACTURED BY T & B, MIDWEST, OR ELECTRIC TUBE PRODUCTS CO.

ALL WIRING SHALL BE ENCLOSED IN A METAL RACEWAY, UNLESS OTHERWISE NOTED.

EXPOSED CONDUIT SHALL BE IN STRAIGHT LINES PARALLEL WITH, OR AT RIGHT ANGLES TO COLUMN LINES OR BEAMS AND SEPARATED BY AT LEAST 3" FROM WATER LINES.

ALL WALL AND FLOOR PENETRATIONS SHALL BE FIRE RATED TO MAINTAIN RATING OF SURFACE PENETRATED. OR 1 HOUR RATING MINIMUM. SEALING SHALL BE WITH 3M #CP25 FIRE PUTTY OR EQUAL BY NELSON.

	SYMBOL LIST
SYMBOL	DESCRIPTION
	FLUORESCENT SUSPENDED LIGHT FIXTURE
Ø	THREE PHASE MOTOR
	CONTROL PANEL BY MECHANICAL TRADES
	DISTRIBUTION PANEL
<u></u>	DISCONNECT SWITCH
₩	COMBINATION MAGNETIC MOTOR STARTER
+	DUPLEX RECEPTACLE OUTLET
VFD	VARIABLE FREQUENCY DRIVE
S _{WP}	SWITCH - WEATHER PROOF
	LED WALL-PACK - WALL MOUNTED
J	JUNCTION BOX
E	EXISTING EQUIPMENT / DEVICE
GFI	GROUND FAULT INTERRUPTER
WP	WEATHERPROOF
	EXISTING TO REMAIN
'////	EXISTING TO BE REMOVED
	NEW

INSTALLATION OF CABLES

BEFORE CONDUCTORS ARE INSERTED IN CONDUIT RUNS, THE CONDUITS SHALL BE SWABBED OR THE EQUIVALENT TO INSURE THEIR DRYNESS AND FREEDOM FROM FOREIGN MATTER DETRIMENTAL TO THE CONDUCTOR INSULATION. ALL WIRING SHALL BE INSTALLED BEFORE FINISHES ARE APPLIED TO WALL AND

WIRE AND CABLES

ALL WIRE AND CABLE SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE CURRENT EDITION OF THE NEC AND SHALL MEET ALL ASTM SPECIFICATIONS. WIRE AND CABLE SHALL BE NEW; SHALL HAVE SIZE, GRADE OF INSULATION, VOLTAGE AND MANUFACTURER'S NAME PERMANENTLY MARKED ON OUTER COVERING AT REGULAR INTERVALS; SHALL BE DELIVERED IN COMPLETE COILS OR REELS WITH IDENTIFYING SIZE AND INSULATION TAGS.

WIRE AND CABLE SHALL BE SUITABLY PROTECTED FROM WEATHER AND DAMAGE DURING STORAGE AND HANDLING AND SHALL BE IN FIRST-CLASS CONDITION WHEN INSTALLED.

ALL WIRING SHALL BE THHN, THWN, XHHW OR TYPE THW UNLESS A HIGHER TEMPERATURE WIRE IS REQUIRED. VERIFY C-1 WIRING REQUIREMENTS WITH UNIT MANUFACTURER.

ALL CONDUCTORS SHALL BE ANNEALED, SOFT-DRAWN COPPER UNLESS OTHERWISE NOTED.

CONDUIT AND WIRE SIZES ARE BASED ON THW CONDUCTORS.

WIRE AND CABLE SHALL BE AS MANUFACTURED BY GENERAL ELECTRIC, GENERAL CABLE, OKONITE OR

MINIMUM SIZE WIRE SHALL BE #12 AWG UNLESS OTHERWISE NOTED. ALL CONDUCTORS SHALL BE COLOR CODED. ALL WIRING SHALL BE INSTALLED IN CONDUIT.

PROVIDE A SEPARATE NEUTRAL CONDUCTOR FOR EACH CIRCUIT OR MULTI-WIRE BRANCH CIRCUIT.

PROVIDE A GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR IN EACH CONDUIT. WHERE CIRCUITS FROM DIFFERENT SOURCES ARE INSTALLED IN THE SAME CONDUIT, SEPARATE EQUIPMENT GROUNDING CONDUCTORS

SHALL BE PROVIDED FOR EACH SOURCE.

NIRE CONNECTIONS SPLICES IN CONDUCTORS NO. 8 AND SMALLER SHALL BE MADE BY PREINSULATED "SCOTCH- LOCK" OR IDEAL "WING-NUT" SPRING TENSION CONNECTORS, INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. SPLICES OF NO. 6 CONDUCTORS AND LARGER SHALL BE MADE WITH SOLDERLESS, COMPRESSION TYPE CONNECTORS, U.L. LABELED AND COMPRESSED WITH APPROVED TOOLS.

ALL SPLICES SHALL BE INSULATED WITH AN APPROVED VINYL PLASTIC ALL WEATHER TAPE TO A THICKNESS EQUIVALENT OF THE CONDUCTOR INSULATION.

ALL CABINETS, CONDUIT SYSTEMS, ETC., SHALL BE THOROUGHLY GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

PROVIDE A SEPARATE GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR IN EACH CONDUIT. WHERE CIRCUITS FROM DIFFERENT SOURCES ARE INSTALLED IN THE SAME CONDUIT, SEPARATE EQUIPMENT GROUNDING CONDUCTORS SHALL BE PROVIDED FOR EACH SOURCE.

CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL MATERIAL REQUIRED FOR FIRE STOPPING ELECTRICAL PENETRATIONS THRU FIRE RATED FLOORS, CEILINGS, ROOF AND WALLS, PER SECTION 01047 "FIRESTOPPING".

FUSES

ALL FUSES SHALL BE DUAL ELEMENT, CURRENT LIMITING CARTRIDGE TYPE AND SHALL HAVE A MINIMUM SHORT-CIRCUIT RATING OF 200,000 RMS AMPS. FUSES SHALL BE BUSSMAN

IN ADDITION OF FUSES BLOWN DURING CONSTRUCTION AND TESTING, A COMPLETE SET OF SPARE FUSES SHALL BE PROVIDED FOR EACH DIFFERENT AMP SIZE OF FUSES ON PROJECT.

FUSES FOR ALL CIRCUITS AND OTHER EQUIPMENT SHALL BE SELECTED IN RATINGS IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, TO PROVIDE A COORDINATED SYSTEM OF OVER-CURRENT PROTECTION. THUS IN CASE OF A FAULT OR HARMFUL OVERLOAD, ONLY THE FUSES NEAREST THE FAULT OR OVERLOADED EQUIPMENT SHALL OPEN.

HANGERS SHALL INCLUDE ALL MISCELLANEOUS STEEL AND SHALL BE FASTENED TO STEEL, CONCRETE OR MASONRY, NOT TO PIPING.

HANGERS AND SUPPORTS EXPOSED TO PUBLIC VIEW MUST BE UNIFORMLY SPACED AND NEATLY INSTALLED, WITH NO EXCESS MATERIAL BEYOND WHAT IS REQUIRED FOR THE SUPPORT FUNCTION.

ALL OUTLET BOXES, PULL BOXES AND JUNCTION BOXES SHALL BE RIGIDLY SECURED IN PLACE IN AN APPROVED METHOD.

NO OUTLETS SHALL BE PLACED BEHIND MECHANICAL PIPES OR HEATING EQUIPMENT OR ENCLOSURES. CHECK DRAWINGS OF OTHER TRADES FOR DOOR SWINGS AND SIZES AND LOCATIONS OF EQUIPMENT AND CABINETS.

ALL SURFACE MOUNTED OUTLET BOXES SHALL BE CROUSE-HINDS FS SERIES OR EQUAL BY KILLARK OR APPLETON, WITH THREADED HUBS AS REQUIRED.

DISCONNECT SWITCHES

PROVIDE AND INSTALL ALL REQUIRED FUSIBLE OR NON-FUSIBLE DISCONNECT SWITCHES SHOWN ON THE DRAWINGS. ALL INDOOR SWITCHES SHALL BE HEAVY DUTY TYPE IN A NEMA I ENCLOSURE, OUTDOOR SWITCHES SHALL BE NEMA 3R.

SWITCHES SHALL BE QUICK-MAKE, QUICK-BREAK WITH A MECHANICAL DUAL COVER INTERLOCK. DISCONNECT SWITCHES SHALL BE SQUARE D, WESTINGHOUSE, GTE SYLVANIA, SIEMENS, CUTLER HAMMER OR GENERAL

PROVIDE AS-BUILT DRAWINGS INDICATING CIRCUIT AND PANEL IDENTIFICATIONS.

	ELECTRICAL SHEET INDEX	
SHEET	DESCRIPTION	
E-1	GENERAL ELECTRICAL INFORMATION	
E-2	ELECTRICAL PENTHOUSE & ROOF DEMOLITION PLANS	
E-3	ELECTRICAL PENTHOUSE FLOOR & ROOF NEW WORK PLANS	
E-4	ELECTRICAL DEMOLITION AND NEW WORK ONE-LINE DIAGRAM	
	ELECTRICAL SCORE	
JVERVIEW OF	ELECTRICAL SCOPE	

THIS OVERVIEW OF SCOPE IS INCLUDED TO GIVE THE CONTRACTOR A GENERAL OVERVIEW OF THE PROJECT REQUIREMENTS. THE OVERVIEW IS NOT ALL INCLUSIVE AND IS NOT INTENDED TO, AND SHOULD NOT BE USED TO, ESTABLISH CONTRACT LIMITS OR PRICING INCLUSIONS. THE CONTRACT DOCUMENTS SHALL BE USED TO ESTABLISH CONSTRUCTION CONTRACT SCOPE.

THIS OVERVIEW OF SCOPE INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:

ELECTRICAL:

1. DISCONNECT AND REMOVE SERVICES TO THE CONDENSER WATER PUMPS.

- 2. DISCONNECT AND REMOVE SERVICE TO EXISTING COOLING TOWER.
- 3. PROVIDE SERVICES TO NEW AIR-COOLED CHILLER AND AUXILIARY EQUIPMENT.
- 4. PROVIDE 120V GFCI OUTLET AT NEW CHILLER.
- 5. PROVIDE EXTERIOR LIGHTING AS INDICATED.

PROJECT REQUIREMENTS

PROVIDE ALL NECESSARY PERMITS. ALL WORK SHALL BE INSTALLED TO COMPLY WITH THE OWNER'S STANDARDS, STATE AND LOCAL CODES INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING CODES AND THEIR RELATED REFERENCES.

- 2017 NATIONAL ELECTRICAL CODE AS AMENDED BY THE MICHIGAN CONSTRUCTION CODE
- PART 8, ELECTRICAL CODE RULES. NFPA 101 LIFE SAFETY CODE 2012 (AS REFERENCED)
- 2015 MICHIGAN ENERGY CODE
- 2015 INTERNATIONAL FIRE CODE (AS REFERENCED)
- 2015 MICHIGAN BUILDING CODE FOR EXISTING BUILDINGS 2015 MICHIGAN MECHANICAL CODE
- 2015 MICHIGAN PLUMBING CODE
- 2015 INTERNATIONAL FUEL GAS CODE 2013 NFPA 110 AND NFPA 111

MANUFACTURER AND MODEL NUMBER LISTED REPRESENTS THE BASIS OF DESIGN FOR THIS PROJECT. THE ELECTRICAL CONTRACTOR SHALL BEAR ALL ADDITIONAL COST ASSOCIATED WITH USING EQUIPMENT BY OTHER APPROVED MANUFACTURERS INCLUDING ADDITIONAL COSTS BY OTHER

ALL EQUIPMENT INSTALLED SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. WHERE FIELD OR PROJECT CONDITIONS DO NOT ALLOW ALL MANUFACTURER'S RECOMMENDATIONS TO BE MET, THE INSTALLING CONTRACTOR SHALL SUBMIT IN WRITING TO THE ENGINEER THE PROPOSED DEVIATION, IN A SKETCH FORM, ACCOMPANIED BY THE MANUFACTURER'S CONCURRENCE.

DiClemente

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CITY OF ANN ARBOR LARCOM CHILLER REPLACEMENT PROJECT ANN ARBOR, MI

ELECTRICAL GENERAL

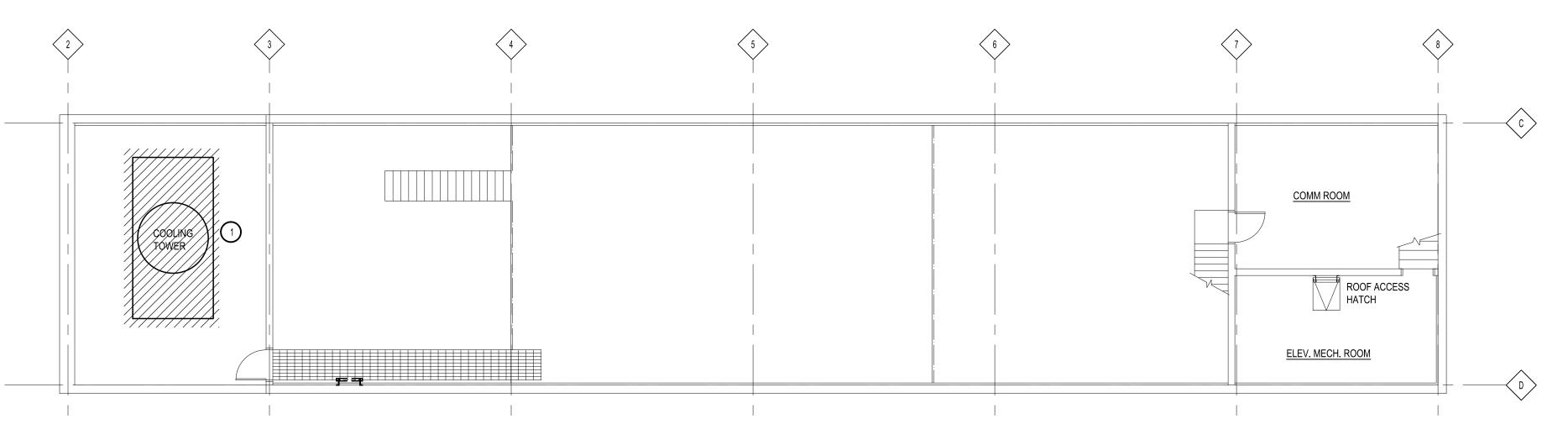
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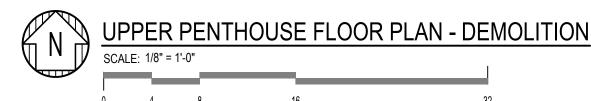
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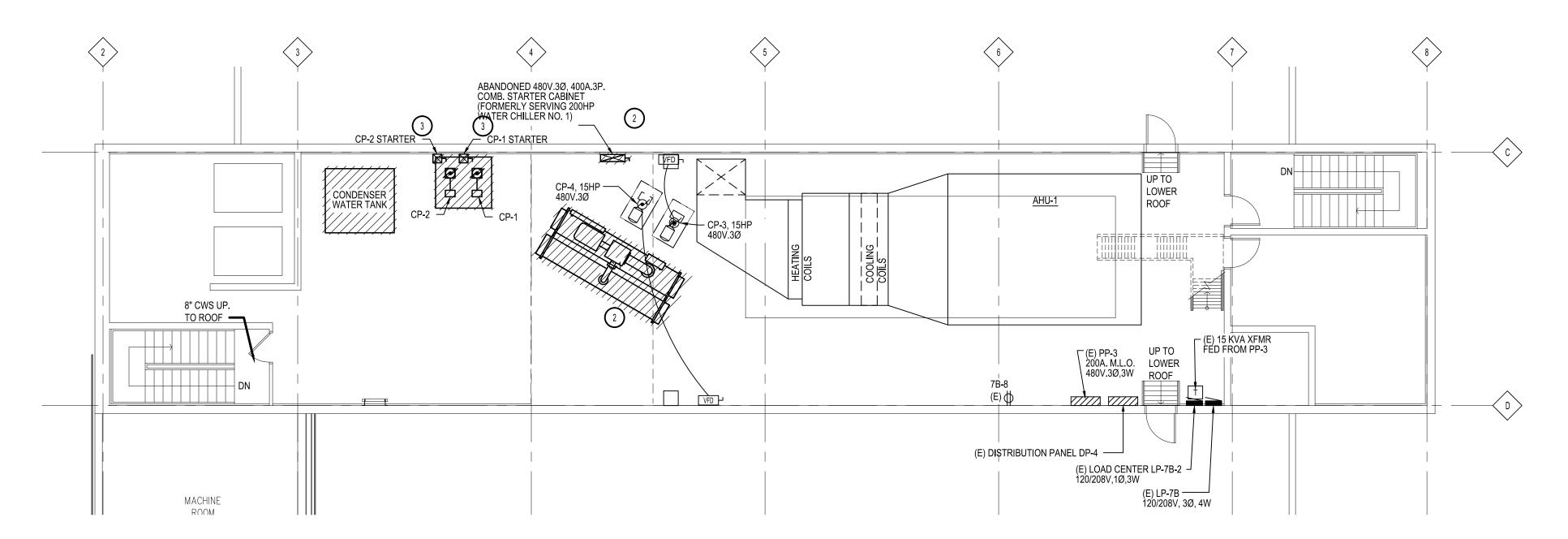
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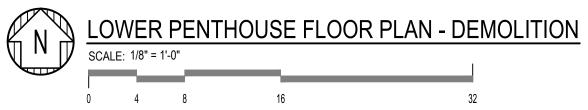
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DESIGNER: JCO DRAWN: DA PM / PIC: JSR/BJR CHECKED: SM **ACADFILE:** 18–1304 E–1 PROJECT No. 18-1304









ELECTICAL DEMOLITION GENERAL NOTES

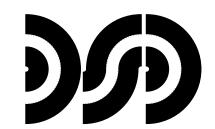
- ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
- 2. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.

DEMOLITION KEY NOTES: (APPLICABLE THIS SHEET ONLY)

DISCONNECT AND REMOVE SERVICE TO EXISTING COOLING TOWER BACK TO SOURCE.

2 REMOVE ABANDONED STARTER FORMERLY SERVING WATER-COOLED CHILLER C-1, AND ASSOCIATED FEEDER.

DISCONNECT AND REMOVE SERVICES TO CONDENSER WATER PUMPS CP-1 AND CP-2 BACK TO SOURCE IN THEIR ENTIRETY.



DiClemente Siegel Design

Engineering and Architecture

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CITY OF ANN ARBOR

LARCOM CHILLER

REPLACEMENT PROJECT

ANN ARBOR, MI

ELECTRICAL PENTHOUSE & ROOF DEMOLITION PLANS

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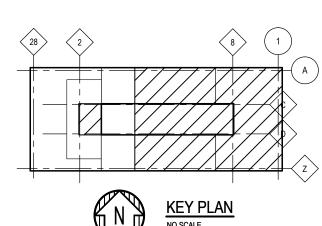
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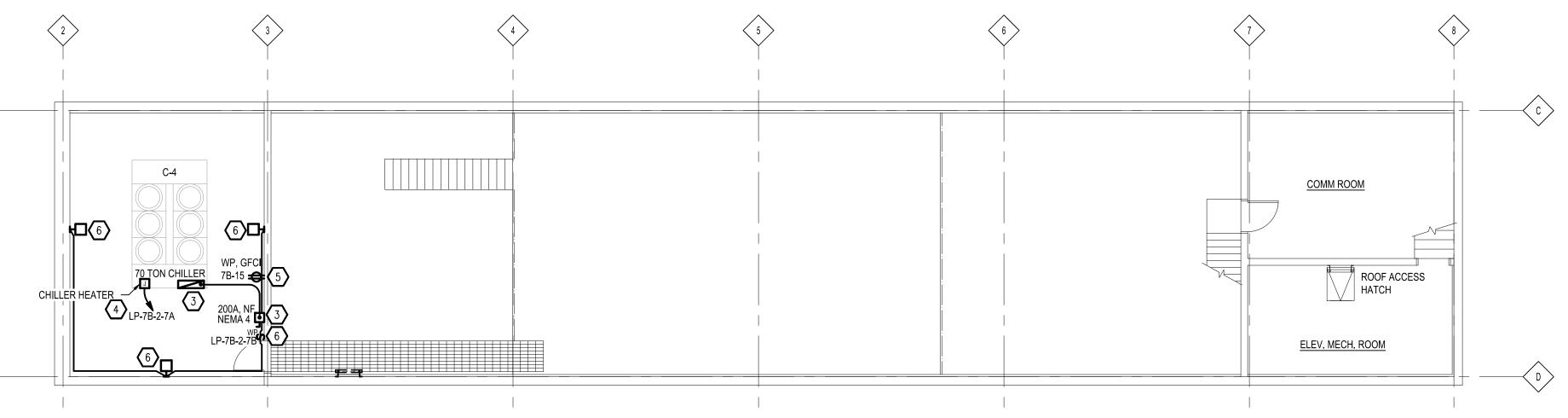
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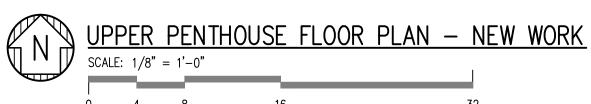
coordination is the contractor's responsibility.

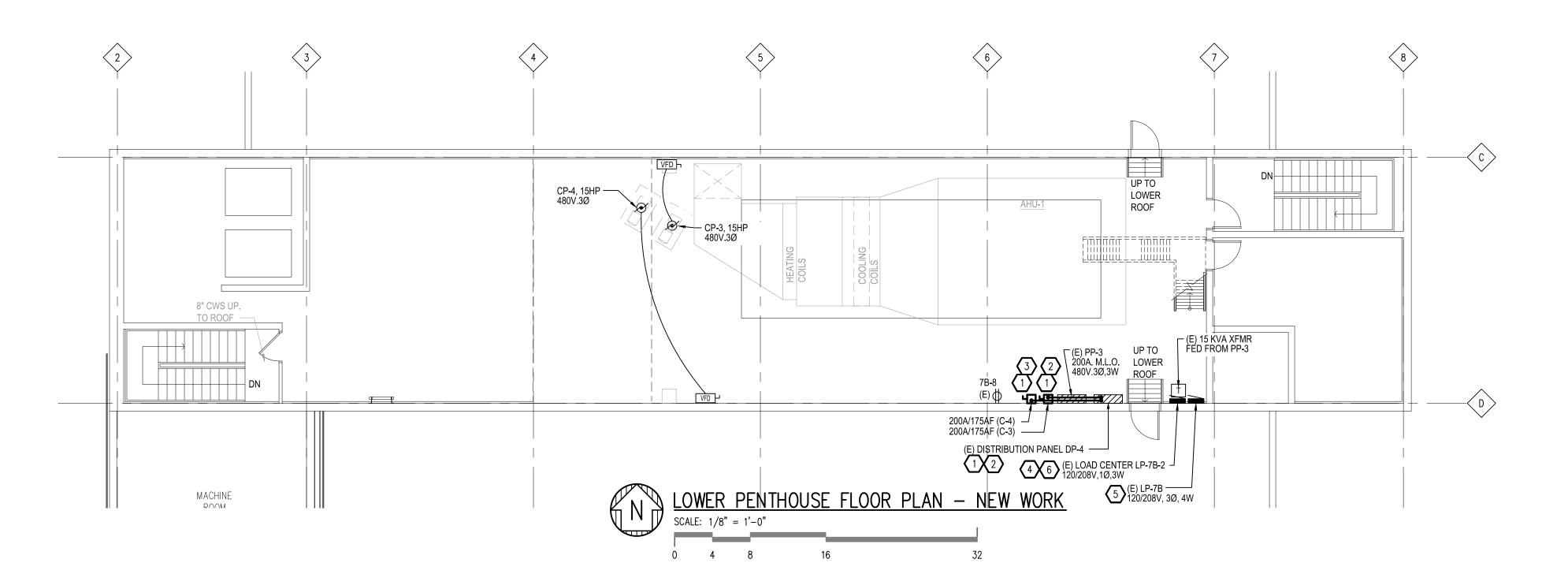
ISSUED FOR	DATE
OWNER REVIEW	02/08/19
BIDS	03/20/19

PROJECT No.	18-1304
ACADFILE:	18-1 3 04-E-2
CHECKED:	SM
PM / PIC:	JSR/BJR
DRAWN:	JMW
DESIGNER:	JCO









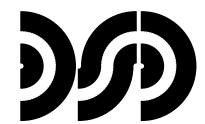
ELECTRICAL GENERAL NOTES

- 1. THESE DRAWINGS ARE DIAGRAMMATIC & INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE PIPING SYSTEMS COMPLETE AND PER SPECIFICATIONS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, AND FITTINGS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR OTHER CONDITIONS.
- 2. CONTRACTOR SHALL COORDINATE HIS WORK WITH THE WORK OF ALL OTHER TRADES. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF
- 3. ALL WORK TO BE DONE IN ACCORDANCE WITH THE 2017 NATIONAL ELECTRICAL CODE.

NEW WORK KEY NOTES:

(APPLICABLE THIS SHEET ONLY)

- PROVIDE TWO 200A, 3-POLE FUSIBLE NEMA 1 SWITCHES FOR SERVICE TO EXISTING AIR-COLED CHILLER C-3 AND NEW AIR-COOLED CHILLER C-4. FEED SWITCHES FROM EXISTING 400A SWITCH IN DISTRIBUTION PANEL DP-4. PROVIDE 200A FEEDERS FROM DP-4 TO EACH 200A SWITCH, 3-#3/0 & #6 GND, 2"C. (10-FOOT TAP RULE). FUSE 400A SWITCH AT 400A. FUSE 200A SWITCHES AT 175A.
- REWORK EXISTING C-3 FEEDER FROM DP-4 TO NEW 200A SWITCH ADJACENT TO DP-4.
- PROVIDE NEW SERVICE TO AIR-COOLED CHILLER C-4 FROM NEW 200A SWITCH ADJACENT TO POWER PANEL PP-3. PROVIDE BRANCH CIRCUIT, 3#3/0 & #6 GND, 2"C.
- PROVIDE 120V, 20A BRANCH CIRCUIT FOR AIR-COOLED CHILLER C-4 HEATING CIRCUIT, 2#12 & #12 GND, 3/4"C. FROM LOAD CENTER LP-7B-2. PROVIDE 20/20A SQUARE D TYPE QO TANDEM BREAKER IN EXISTING
- PROVIDE 120V, 20A GFCI DUPLEX OUTLET WITH WEATHER-PROOF WHILE-IN-USE COVER AND ASSOCIATED BRANCH CIRCUIT, 2#12 & #12 GND, 3/4"C. BACK TO LIGHTING PANEL LP-7B, CIRCUIT 15.
- 6 LED WALL PACK WITH ADJUSTABLE LIGHT OUTPUT, 5000°K COLOR TEMPERATURE, TYPE III LIGHT DISTRIBUTION. 120V, PHOTOCELL RECEPTACLE, SINGLE FUSE, SURGE PROTECTIVE DEVICE AND DARK BRONZE FINISH: LITHONIA NO. TWH LED ALO 50K T3M 120 PER SF SPD DDBXD WITH DLL127F1.5JU PHOTOCELL, OR EQUAL. PROVIDE WP LOCAL WALL-MOUNTED SWITCH AND BRANCH CIRCUIT TO LOAD CENTER LP-7B-2.



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> CITY OF ANN ARBOR LARCOM CHILLER REPLACEMENT PROJECT ANN ARBOR, MI

ELECTRICAL PENTHOUSE FLOOR & ROOF NEW WORK **PLANS**

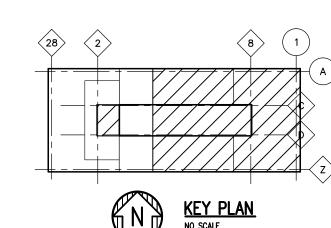
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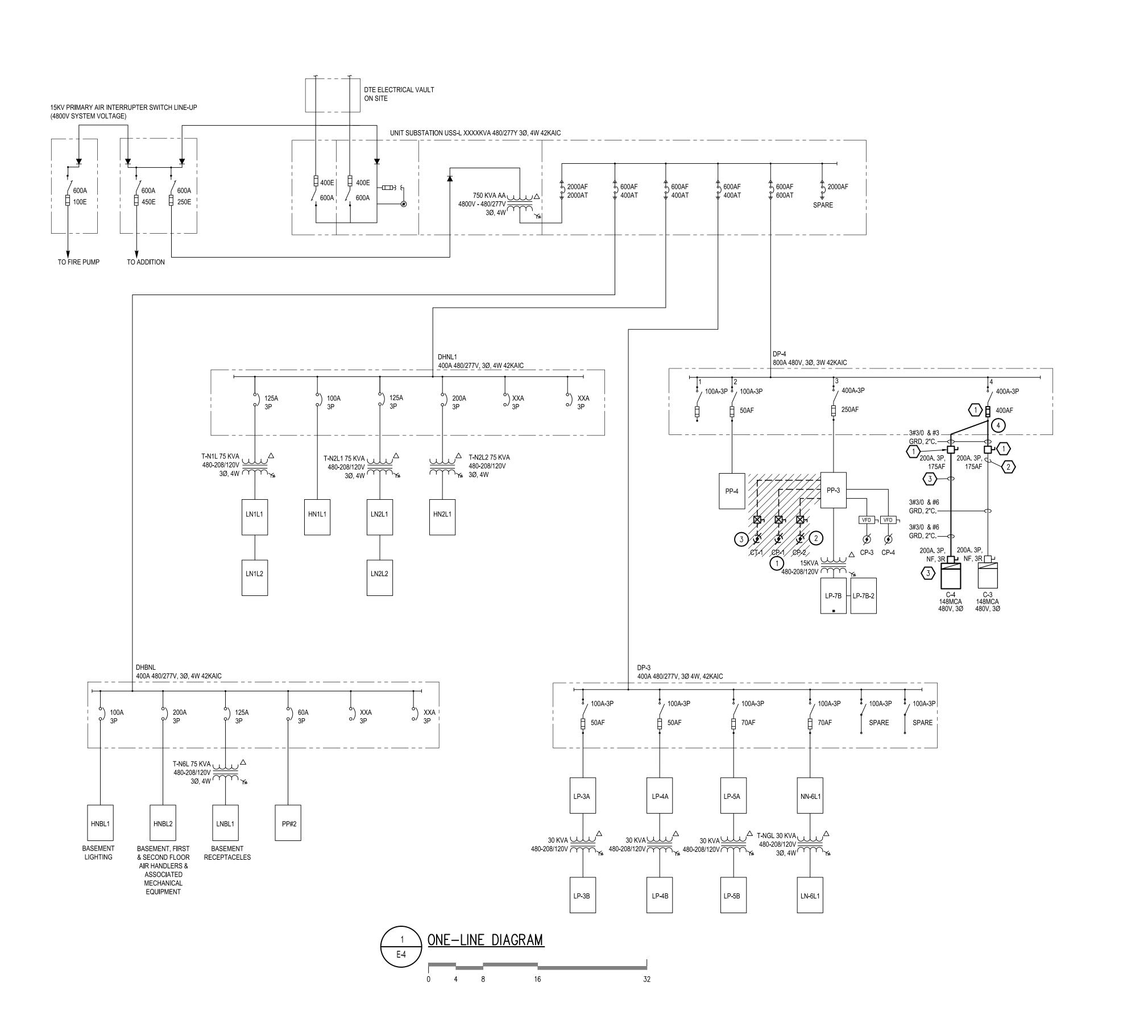
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DRAWN:	JMW
PM / PIC:	JSR/BJR
CHECKED:	SM
ACADFILE:	18-1304-E-3
PROJECT No.	18-1304





ELECTRICAL GENERAL NOTES

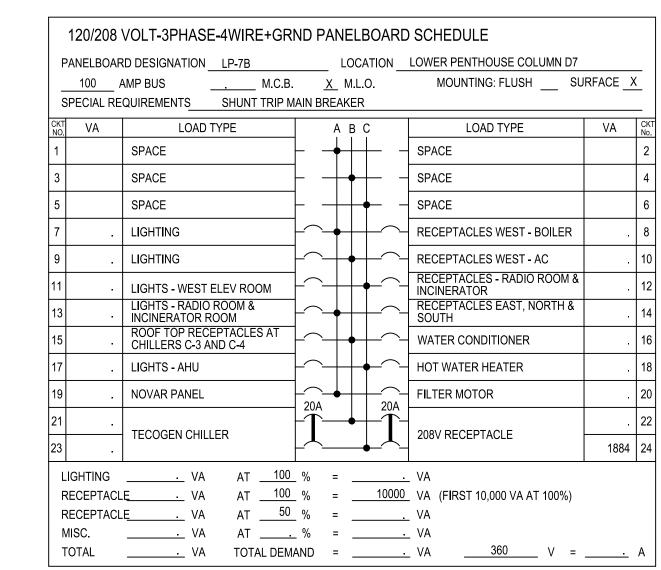
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- CONTRACTOR SHALL COORDINATE HIS WORK WITH THE WORK OF ALL OTHER TRADES.
 VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY WORK.
- 3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 NATIONAL ELECTRICAL CODE.

DEMOLITION KEY NOTES:

- DISCONNECT AND REMOVE SERVICE TO CONDENSER WATER PUMP CP-1, INCLUDING STARTER AND BRANCH CIRCUIT BACK TO SOURCE AT PENTHOUSE PANEL PP-3. IDENTIFY SWITCH AT PANEL AS SPARE.
- DISCONNECT AND REMOVE SERVICE TO CONDENSER WATER PUMP CP-2, INCLUDING STARTER AND BRANCH CIRCUIT BACK TO SOURCE AT PENTHOUSE PANEL PP-3. IDENTIFY SWITCH AT PANEL AS SPARE
- DISCONNECT AND REMOVE SERVICE TO COOLING TOWER CT-1, INCLUDING STARTER AND BRANCH CIRCUIT BACK TO SOURCE AT PENTHOUSE PANEL PP-3. IDENTIFY SWITCH AT PANEL AS SPARE.
- disconnect existing circuit supplying air-cooled chiller C-3 from 400a switch at penthouse distribution panel DP-4. Retain feeder for Re-use.

NEW WORK KEYED NOTES:

- PROVIDE 480V, 3P, 200A HEAVY DUTY FUSIBLE DISCONNECT SWITCHES ADJACENT TO DISTRIBUTION PANEL DP-4 FOR SERVICE TO EXISTING AIR-COOLED CHILLER C-3 AND NEW AIR-COOLED CHILLER C-4. PROVIDE FEEDERS TO EACH SWITCH FROM 400A SWITCH IN DP-4 AS INDICATED. FUSE SWITCH IN DP-4 AT 400A.
- REWORK FEEDER FROM CHILLER C-3 TO NEW 200A FUSIBLE SWITCH. FUSE SWITCH AT 175A.
- PROVIDE FEEDER FROM 200A FUSIBLE SWITCH TO NEW 480V, 200A, 3-POLE NON-FUSIBLE NEMA 3R DISCONNECT AT CHILLER C-4 EXTEND FEEDER TO CHILLER CONTROL PANEL. PROVIDE 175A FUSES AT FUSIBLE SWITCH.



ALL CIRCUIT BREAKERS ARE 20A-1P, UNLESS NOTED OTHERWISE.

120/208VOLT-1PHASE-3WIRE+GRND PANELBOARD SCHEDULE

PANELBOARD DESIGNATION: LP-7B-2 LOCATION: LOWER PENTHOUSE COL. D7

7B EXTERIOR LIGHT AT CHILLER C-4			
8 SPACE (DO NOT USE)			
	·	AT % = VA	
RECEPTACL	<u> </u>	AT <u>100</u> % = <u>10000</u> VA (FIF	RST 10,000 VA AT 100%)
RECEPTACL	<u>Ę</u> . VA	AT	
MISC.	VA	AT % = VA	
TOTAL	VA	TOTAL DEMAND = VA /	<u>120</u> V = A



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LARCOM CHILLER
REPLACEMENT PROJECT
ANN ARBOR, MI

ELECTRICAL
DEMOLITION AND
NEW WORK
ONE-LINE DIAGRAM

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