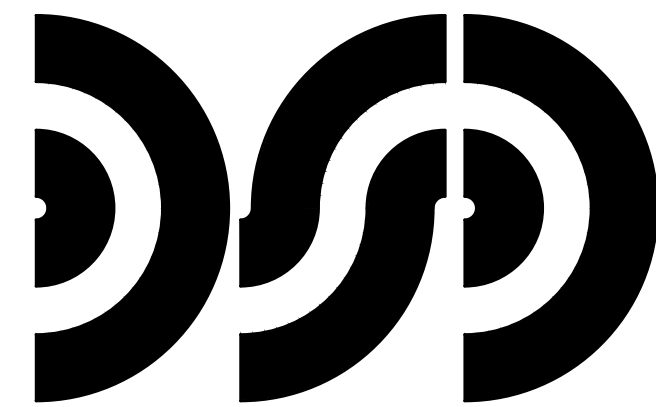


CITY OF ANN ARBOR

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

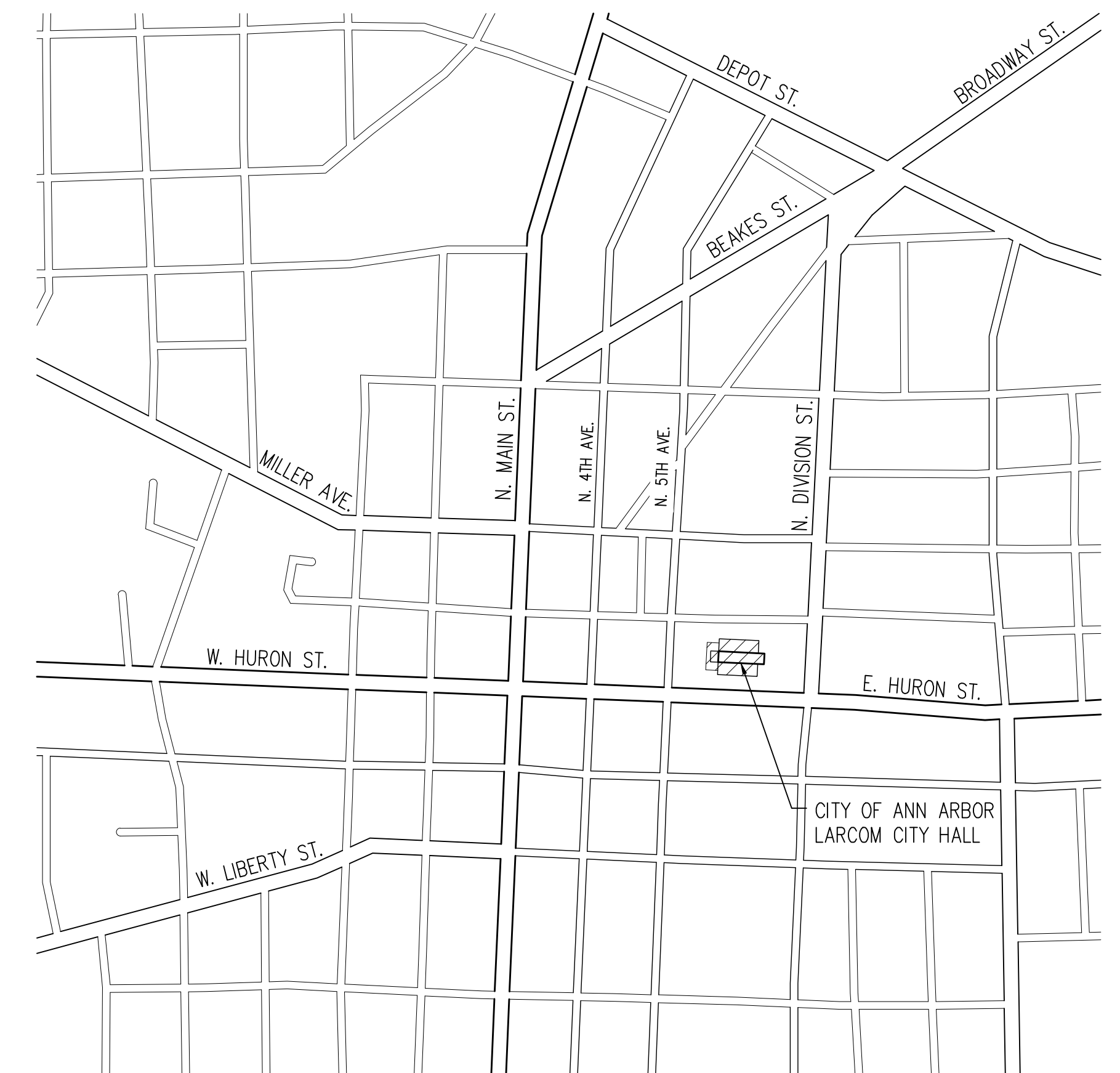
SHEET	DESCRIPTION
A-001	ARCHITECTURAL GENERAL INFORMATION
A-101	ARCHITECTURAL PENTHOUSE PLAN & DETAILS

MECHANICAL SHEET INDEX

SHEET	DESCRIPTION
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M-3	PENTHOUSE FLOOR & ROOF NEW WORK PLANS
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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



SHEET:
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G-1
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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. SECTION INCLUDES:
 1. DEMOLITION AND REMOVAL OF SELECTED PORTIONS OF BUILDING OR STRUCTURE.
 2. DEMOLITION AND REMOVAL OF SELECTED SITE ELEMENTS.
 3. 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 OWNER.
 - 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.
 - B. 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.
 1. 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 PERMITTED.
 - 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 PERFORMANCE 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 ANSIASSE A10.6 AND NFPA 241.

PART 3 - EXECUTION

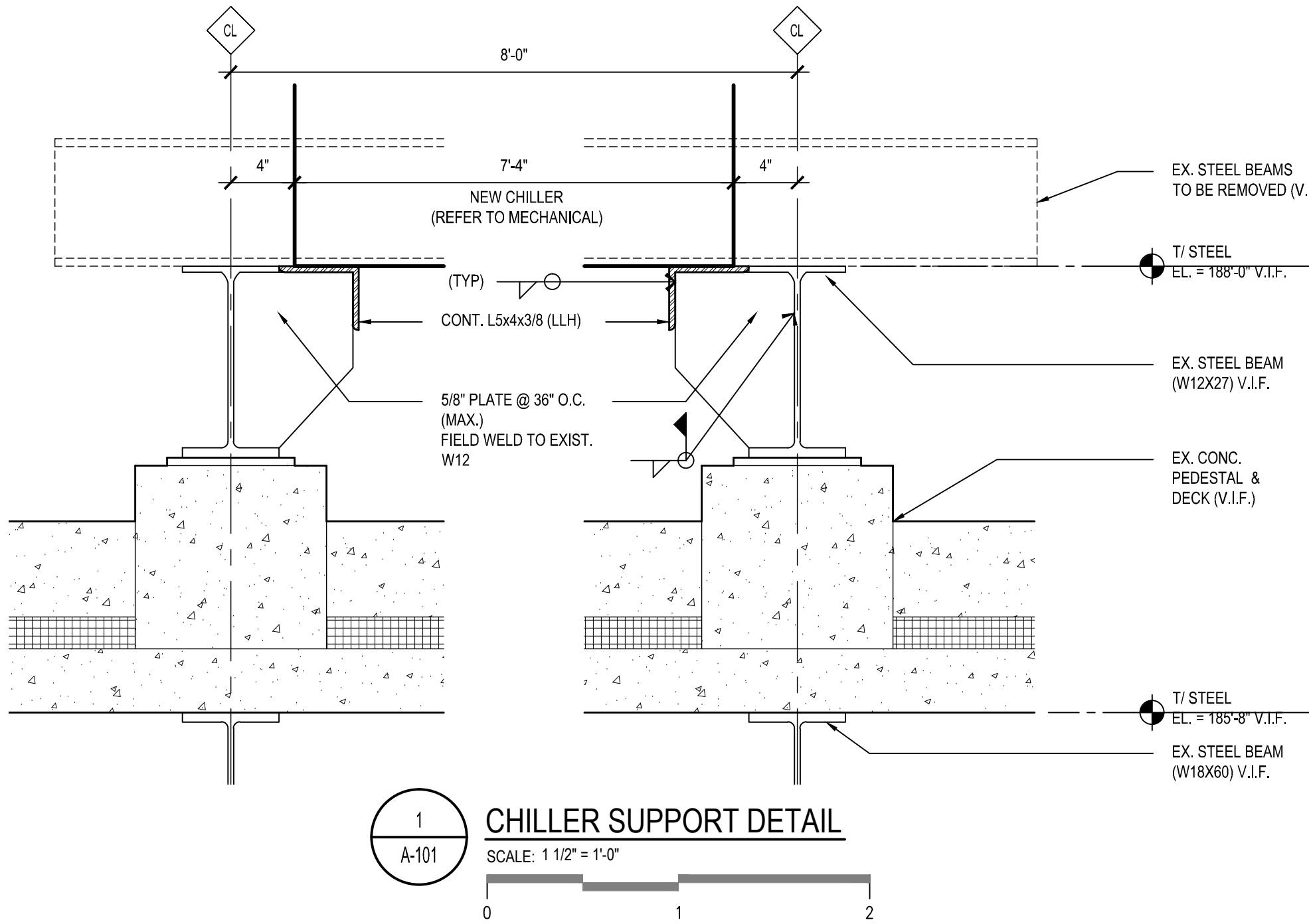
- 3.1 EXAMINATION
 - A. VERIFY THAT UTILITIES HAVE BEEN DISCONNECTED AND CAPPED BEFORE STARTING SELECTIVE DEMOLITION OPERATIONS.
 - B. SURVEY EXISTING CONDITIONS AND CORRELATE WITH REQUIREMENTS INDICATED TO DETERMINE EXTENT OF SELECTIVE DEMOLITION REQUIRED.
 - C. WHEN UNANTICIPATED MECHANICAL, ELECTRICAL, 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.
 1. COMPLY WITH REQUIREMENTS FOR EXISTING SERVICES/SYSTEMS INTERRUPTIONS SPECIFIED IN SECTION 01100 "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.
 1. 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.
 4. 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 REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
- 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.

- 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:
 1. CONTRACTOR SHALL OBTAIN A HOT WORK PERMIT FROM THE CITY OF ANN ARBOR.
 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 REMAIN.
 3. CUT OR DRILL FROM THE EXPOSED OR FINISHED SIDE INTO CONCEALED SURFACES TO AVOID MARRING EXISTING FINISHED SURFACES.
 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 OPERATIONS.
 5. 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.
 2. PACK OR CRATE ITEMS AFTER CLEANING AND REPAIRING. IDENTIFY 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, OR 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 BY SHAPE:
 - 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 E70XX 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 SHOWN 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 "HILT KWIK BOLT II" OR APPROVED EQUAL. ADHESIVE SHALL BE "HILT HIL 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.



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.
2. PATCH AND REPAIR WALL PENETRATIONS.
3. 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.

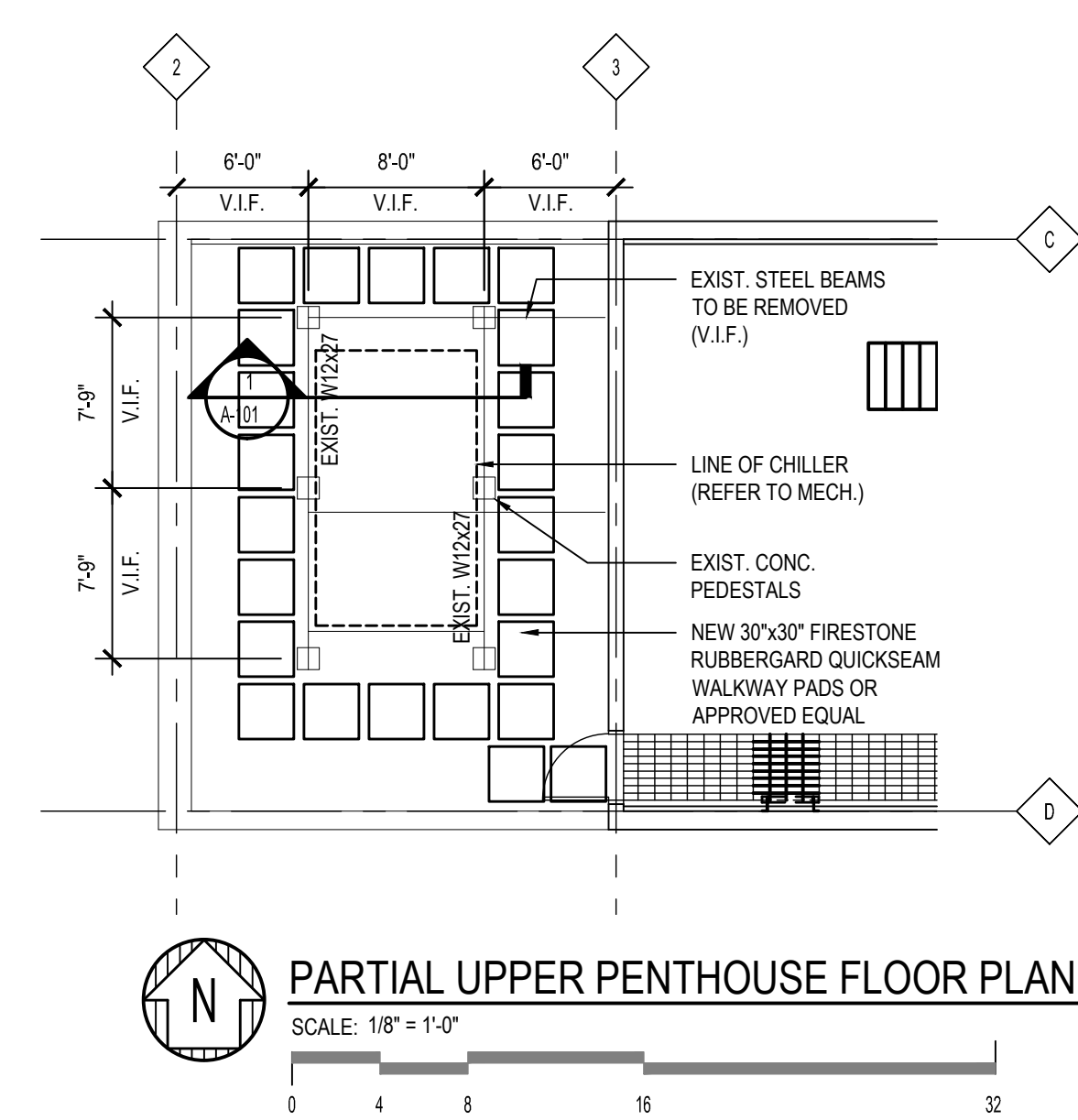
- 2015 MICHIGAN MECHANICAL CODE
- 2015 MICHIGAN PLUMBING CODE
- 2015 INTERNATIONAL FIRE CODE (AS REFERENCED)
- 2015 INTERNATIONAL FUEL GAS CODE
- NFPA 101 LIFE SAFETY CODE 1997 AND 2006 (AS REFERENCED)
- MICHIGAN ENERGY CODE-ASHRAE 90.1-2013
- 2014 NATIONAL ELECTRICAL CODE AS AMENDED BY THE 2014 MICHIGAN 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:

1. VERIFY EXISTING CONDITIONS IN FIELD.
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 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 AND CONSTRUCTION. TYPICAL REPAIR OF DAMAGED EXISTING FINISHES WILL BE AT THE CONTRACTORS EXPENSE, TYPICAL.
7. REFER TO OTHER SHEETS OF THIS DOCUMENT SET FOR COMPLETE CONTRACT REQUIREMENTS, TYPICAL.
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 C&I MICHIGAN 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.



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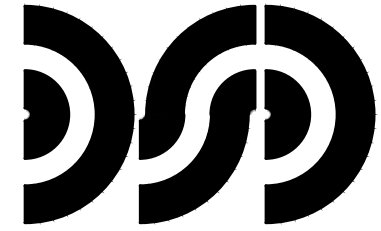
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2. ENTER SHEET NOTE 2 HERE

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

**ARCHITECTURAL
GENERAL
INFORMATION**

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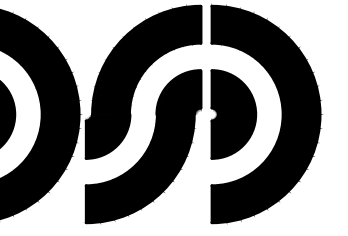
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DRAWN:	LTS
PM / PIC:	JSR/BJR
CHECKED:	JSR
ACAD FILE:	181304A1
PROJECT No:	18-1304

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

**ARCHITECTURAL
PENTHOUSE PLAN &
DETAILS**
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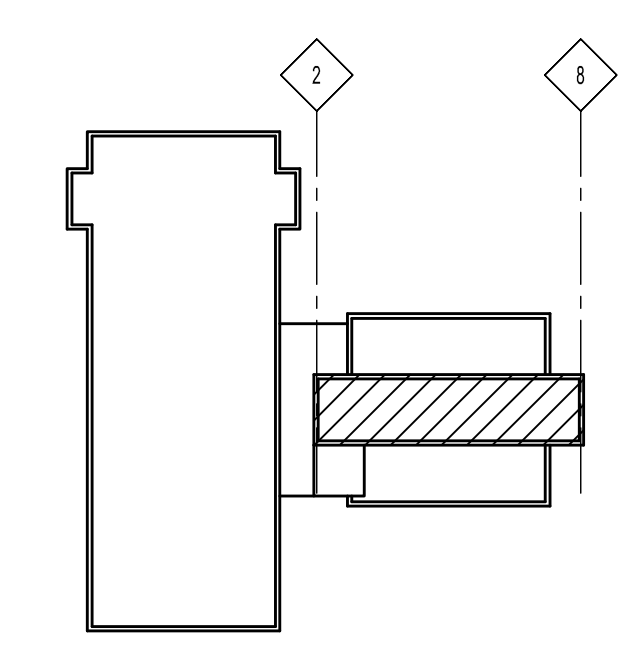
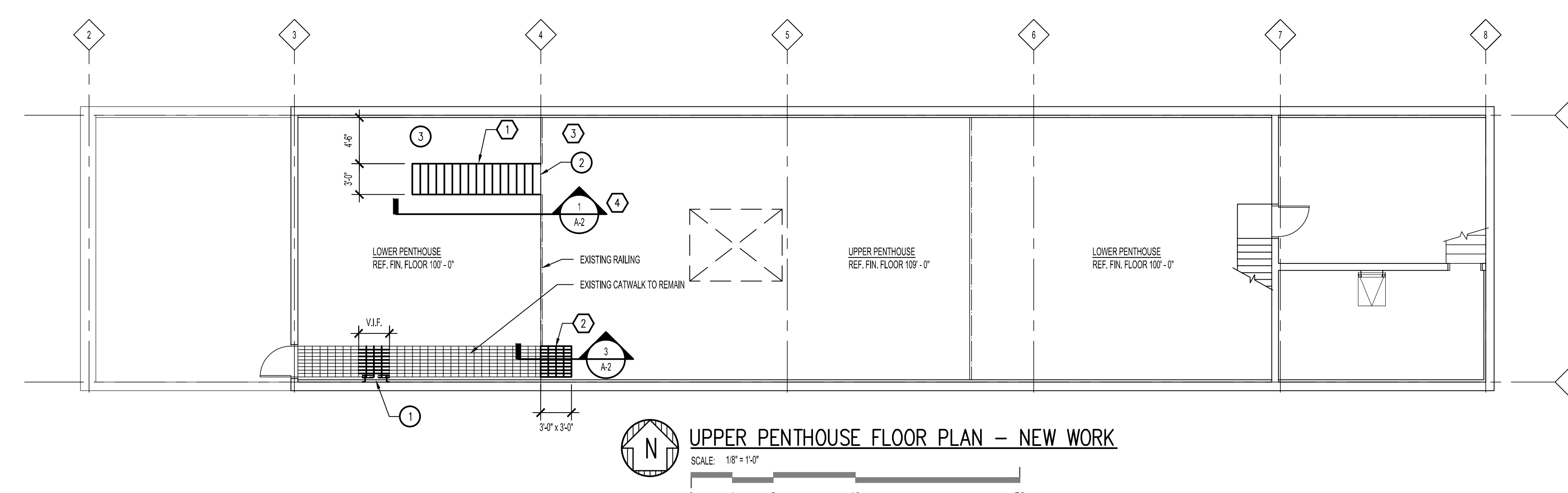
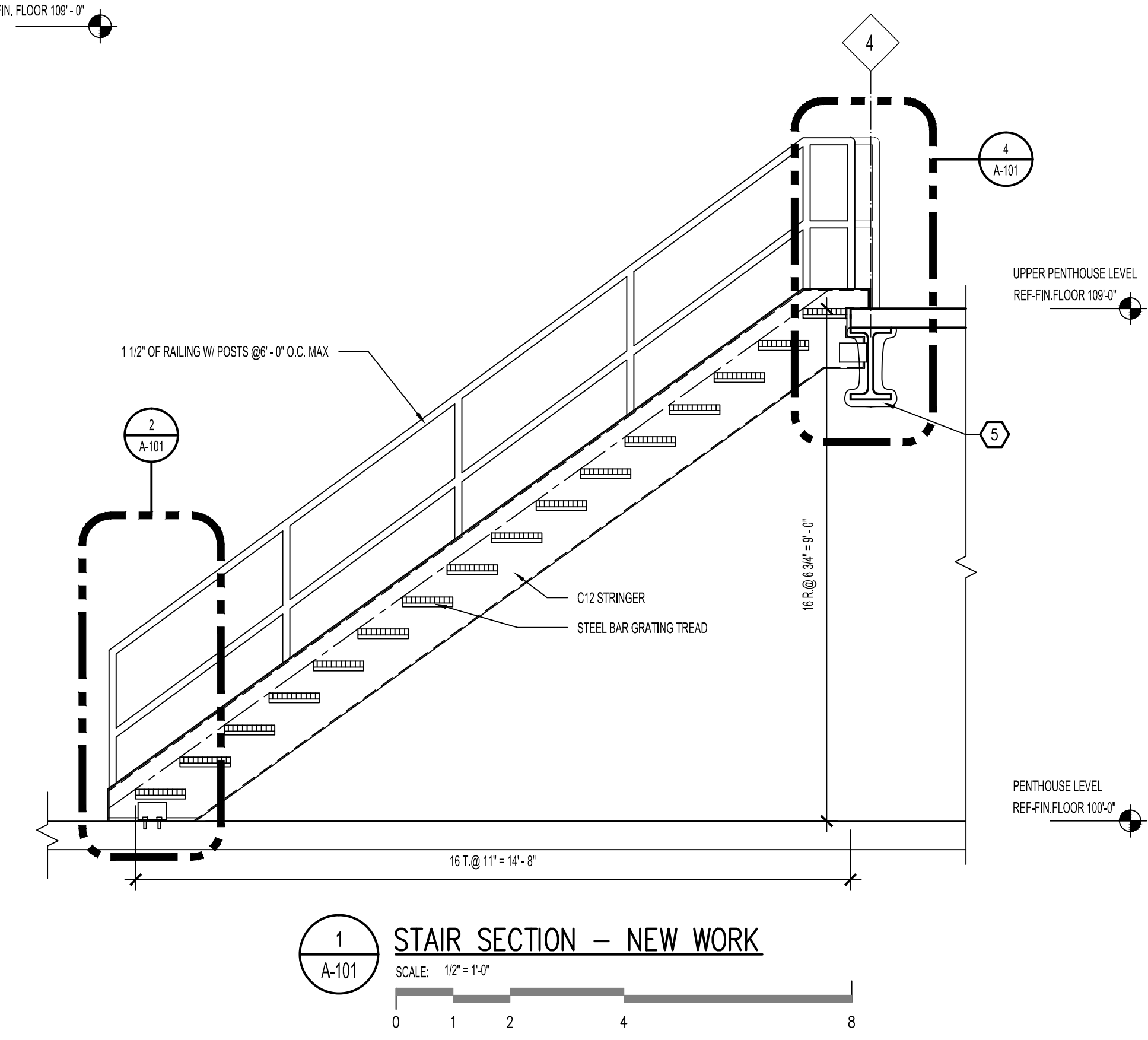
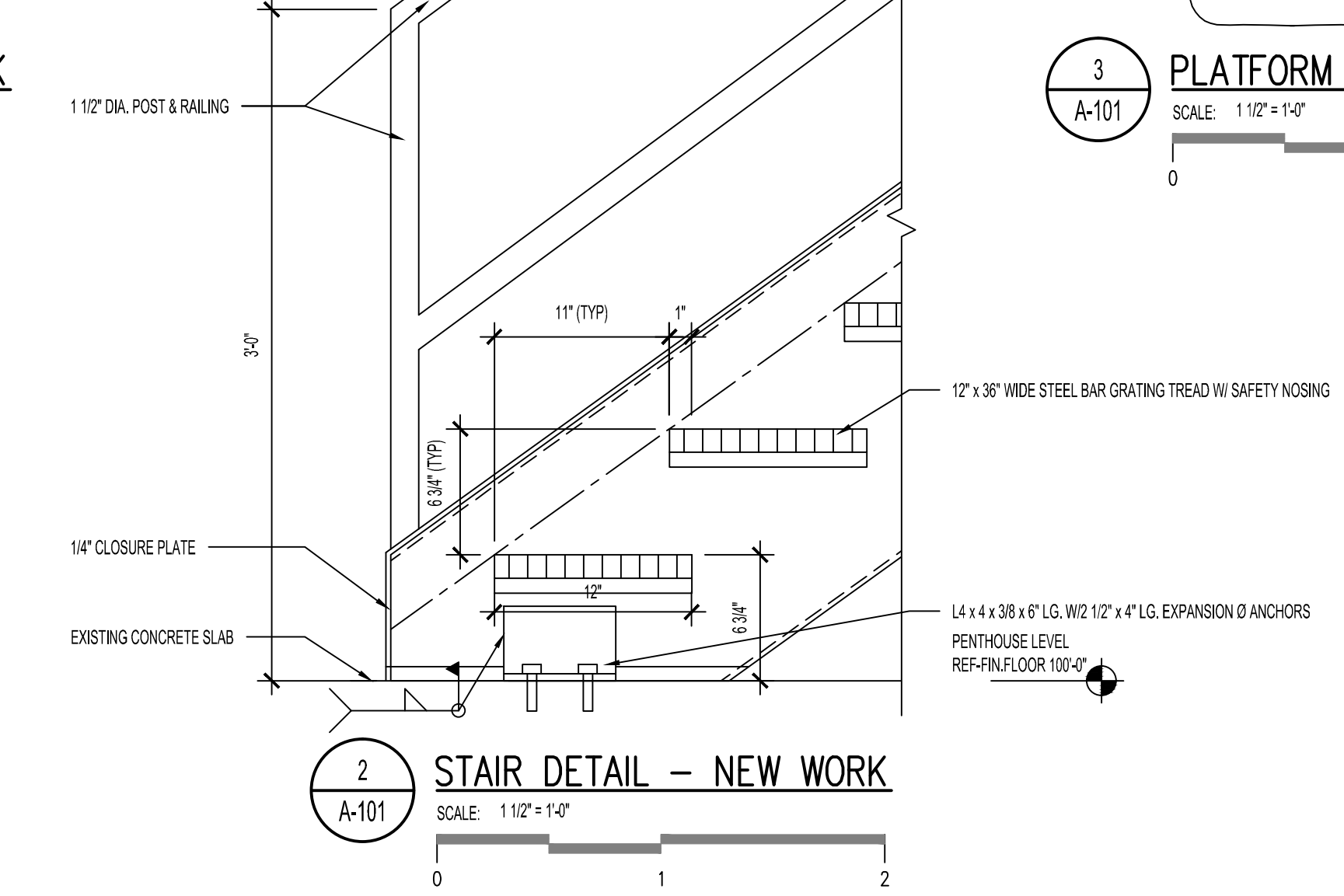
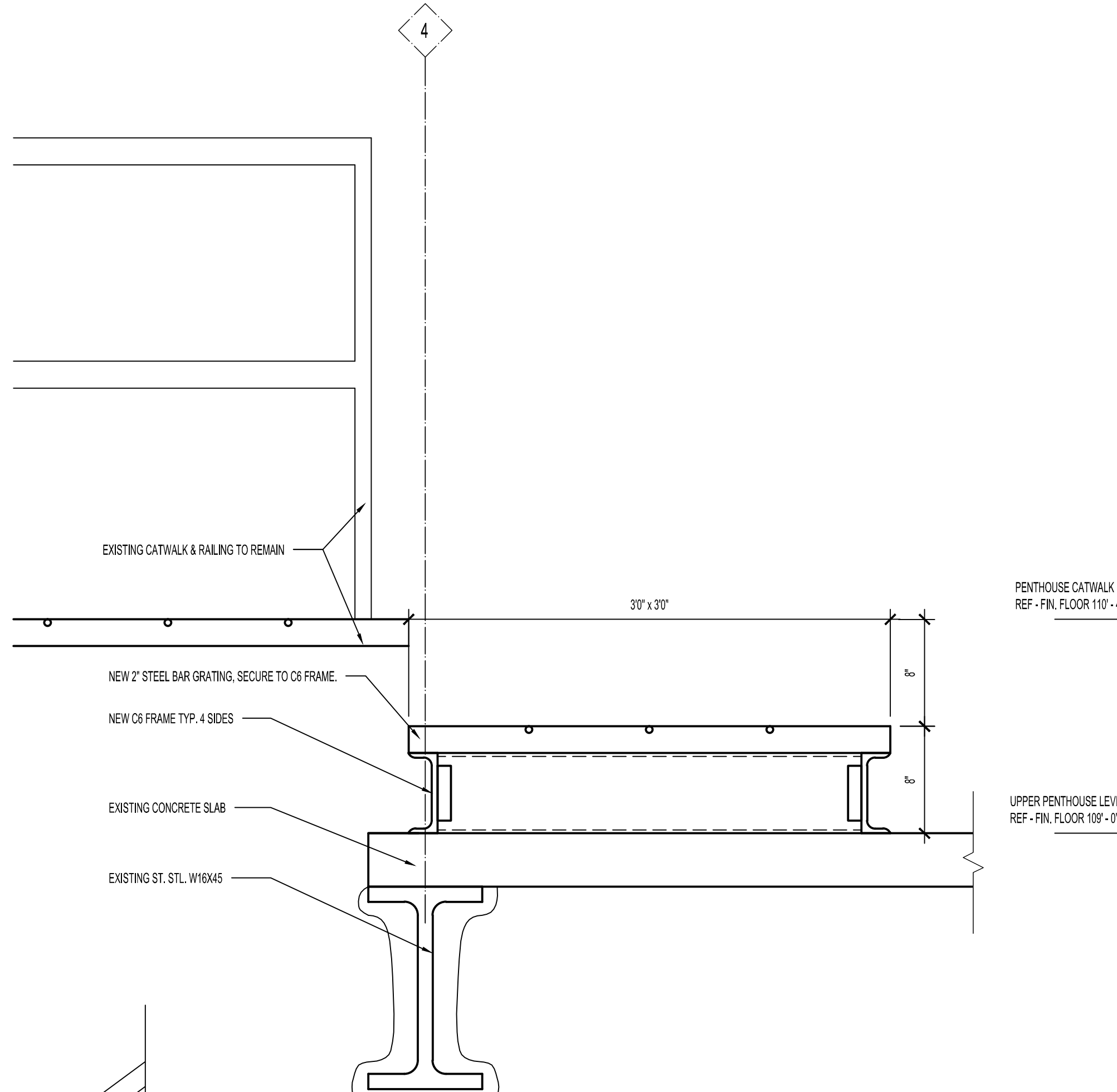
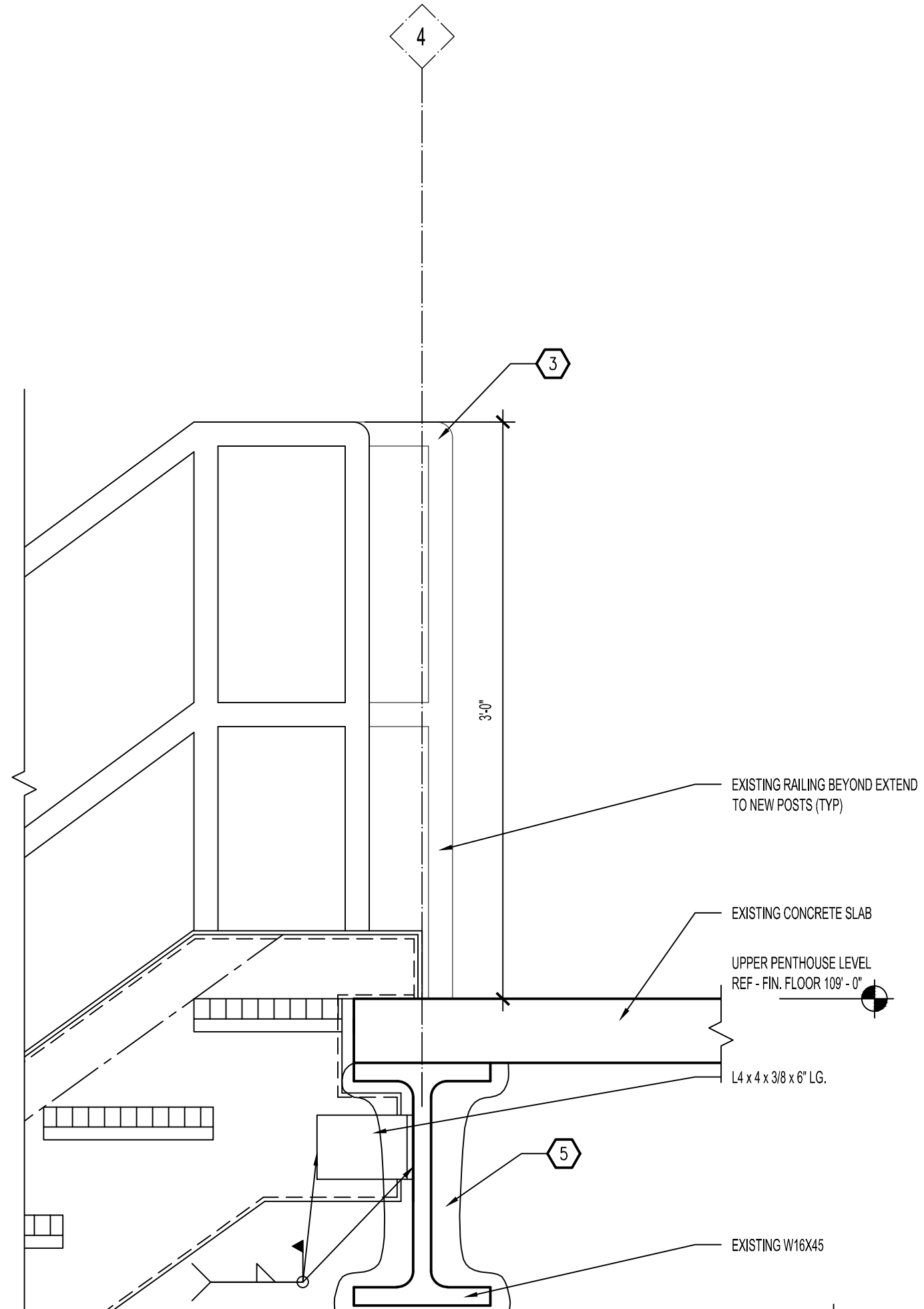
- CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO DEVELOPMENT OF FABRICATION DRAWINGS.

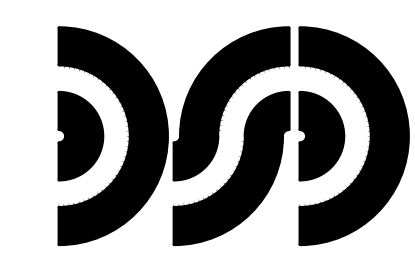
DEMOLITION KEYED NOTES:
(APPLICABLE THIS SHEET ONLY)

- REMOVE EXIST. WALL MOUNTED LADDER AND BRACKETS.
- REMOVE STEEL HANDRAIL AT LOCATION OF NEW STAIR.
- REMOVE EXIST. CONCRETE PAD. REPAIR CONC. TO MATCH ADJACENT ELEVATION AND FINISH. REFER TO MECHANICAL FOR ADDITIONAL INFORMATION.

NEW WORK KEYED NOTES:
(APPLICABLE THIS SHEET ONLY)

- NEW STAIR
- NEW PLATFORM REFER TO DETAIL 2/A101
- EXTEND EXISTING RAILINGS TO NEW STAIR RAILING POSTS TYP.
- PROVIDE FOAM PADDING AT EXIST. FIRE PROTECTION PIPING ABOVE
- RESTORE FIRE PROOFING ON EXISTING STRUCTURAL STEEL. MATCH EXISTING.
- INFILL EXISTING OPENING W/ 1 1/4" BAR GRATING TO MATCH EXISTING.





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

**MECHICAL
GENERAL
INFORMATION &
SCHEDULES**

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BIDS	03/20/19

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DRAWN:	DMN
PM / PIC:	JSR/BJR
CHECKED:	DCM
ACADFILE:	18-1304-M-1
PROJECT No.:	18-1304

M-1

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:

- MECHANICAL:**
- DEMOLISH AND REMOVE EXISTING NATURAL GAS FIRED CHILLER, AND ASSOCIATED GAS PIPING AND CHILLED WATER CONNECTIONS. DEMOLISH EXISTING COOLING TOWER, CONDENSER WATER TANK, CONDENSER WATER PUMPS AND ASSOCIATED PIPING.
 - PROVIDE NEW ROOF MOUNTED AIR COOLED CHILLER. PROVIDE NEW CHILLED WATER PIPING TO CONNECT TO EXISTING CHILLED WATER PIPING SYSTEM.
 - MODIFY CHILLED WATER CONTROL SYSTEM TO ACCOMMODATE NEW CHILLER AND CONTROL SEQUENCE.
 - 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 TRADES.

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

- 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).
- 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.
- EACH SYSTEM SHALL BE TESTED IN EACH MODE OF OPERATION.
- DISCHARGE AIR TEMPERATURE, PRESSURE AND OTHER SYSTEM PARAMETERS ARE TO BE RECORDED DURING TESTING.
- TEST IS TO SIMULATE VARYING SPACE DEMAND TO PROVE THE SYSTEM CONTROLS ARE AUTOMATICALLY FUNCTIONING.
- SYSTEM SAFETY FEATURES (FREEZE THERMOSTATS, HIGH PRESSURE, ETC.) ARE TO BE TESTED TO PROVE OPERATION.
- TCC SHALL PROVIDE A WRITTEN REPORT FOR EACH CONTROLLED COMPONENT SHOWING TESTING AND PROPER OPERATION.
- 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.

ABBREVIATIONS

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 BTUHR (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
V.T.R.	VENT THROUGH ROOF

PIPING LEGEND

SYMBOL	DESCRIPTION
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CWR	CONDENSER WATER SUPPLY
CWS	CONDENSER WATER SUPPLY

SYMBOL LEGEND

TWO LINE SYMBOLS	SCHEMATIC SYMBOLS	DESCRIPTION
		EXISTING TO REMAIN
		EXISTING TO BE REMOVED
		NEW WORK
		NEW CONNECTION TO EXISTING
		PIPING ELBOW
		PIPING ELBOW UP
		PIPING ELBOW DOWN
		PIPING TEE
		PIPING TEE UP
		PIPING TEE DOWN
		DIELECTRIC UNION OR FLANGE CONNECTION
		ISOLATION VALVE
		GATE VALVE
		CHECK VALVE
		BUTTERFLY VALVE
		MOTORIZED DEVICE
		SOLENOID VALVE
		BALL VALVE
		GLOBE VALVE
		LUBRICATED PLUG VALVE
		BALANCE VALVE
		CONTROL VALVE - 2 WAY
		CONTROL VALVE - 3 WAY
		BACKWATER VALVE
		STRAINER
		THERMOMETER
		PRESSURE GAUGE WITH BALL VALVE
		CIRCUIT SETTER
		FLOW METER
		PIPE ANCHOR
		PIPE GUIDE
		FLOW ARROW
		CONCENTRIC REDUCER (PIPE OR DUCT)
		ECCENTRIC REDUCER (PIPE OR DUCT)

AIR COOLED CHILLER SCHEDULE

MARK	LOCATION	SYSTEM SERVED	NOMINAL CAPACITY (TONS)	EVAPORATOR						CONDENSER					COMPRESSOR			UNIT POWER			DIMENSION	OPERATING WEIGHT	BASIS OF DESIGN MODEL NUMBER	REMARKS	
				E.W.T. °F	L.W.T. °F	NO. OF PASSES	GPM	MAX. PRESS. DROP (FT.)	FLUID	FOULING FACTOR	AMBIENT °F	NO. OF FANS	HP EACH	EER	IPLV (BTU/WH)	TYPE	REFRIGERANT	NUMBER OF INDEPENDENT REFRIGERANT CIRCUITS	KW	VOLTAGE					PHASE
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:

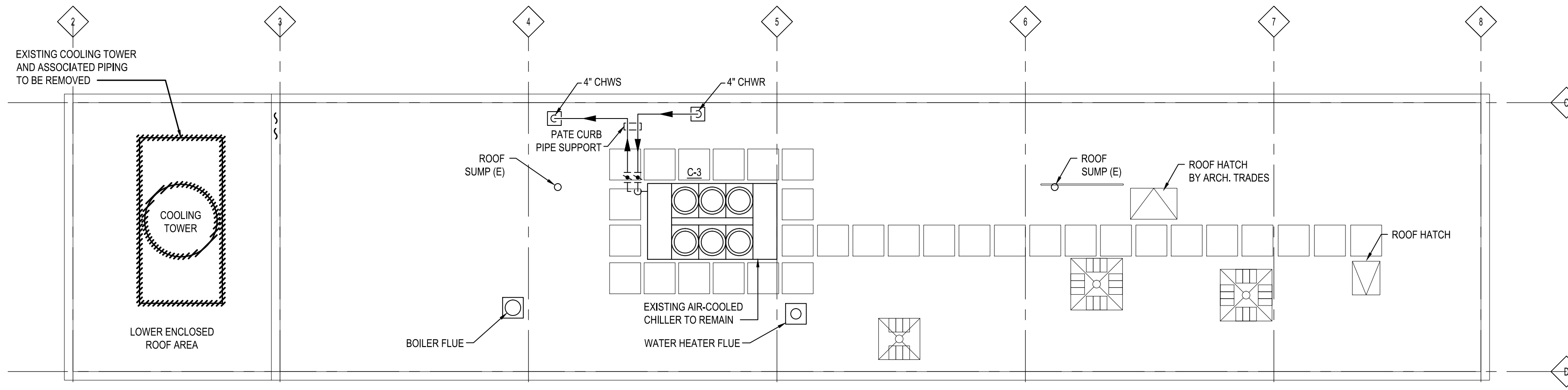
- PROVIDE EVAPORATOR IMMERSION HEATER CONNECTION, 115V, LOW AMP, 1φ POWER CONNECTION.
- PROVIDED WITH TRANE CH530 MICROPROCESSOR.
- PROVIDED WITH UNIT MOUNTED STARTER, UL1995 LIGHT.
- PROVIDE SINGLE SOURCE POWER CONNECTIONS.

ARCHITECTURAL - MECHANICAL - ELECTRICAL COORDINATION SCHEDULE

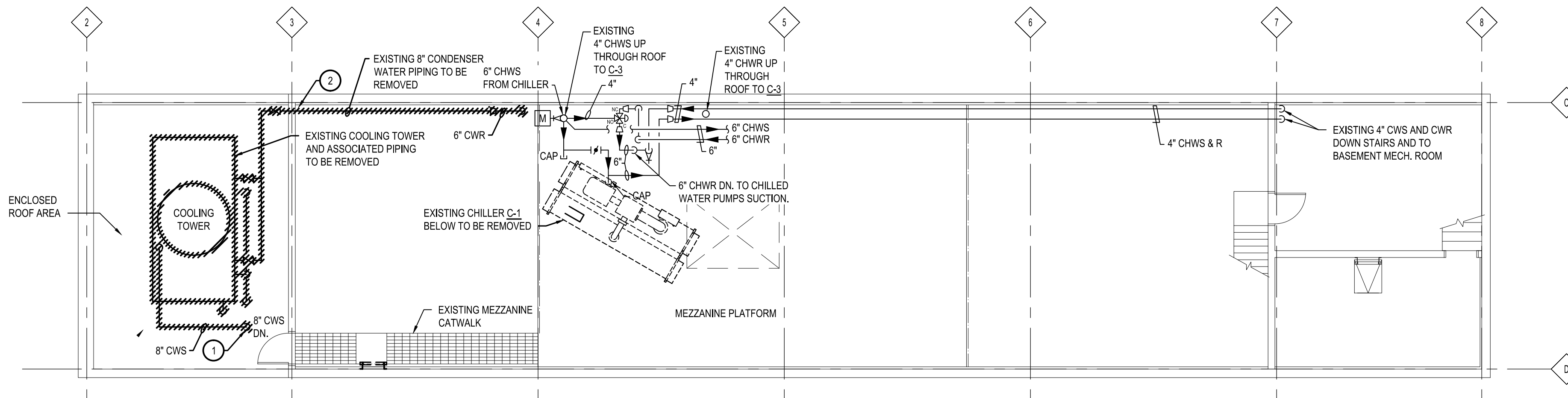
MARK	LOCATION	HP	KW	MCA	ELECTRICAL		DISCONNECT		STARTER		REMARKS
					VOLTAGE	PHASE	FURN.	INST.	FURN.	INST.	
C-4	ENCLOSED ROOF	-	76	147.8A	460	3	E	E	S	S	-
C-4 FREEZE PROTECTION HEATER	ENCLOSED ROOF	-	-	15A	120	1	E	E	S	S	SEPARATE CIRCUIT CONNECTION FOR FREEZE PROTECTION HEATER TO NEW C-4 CHILLER

LEGEND

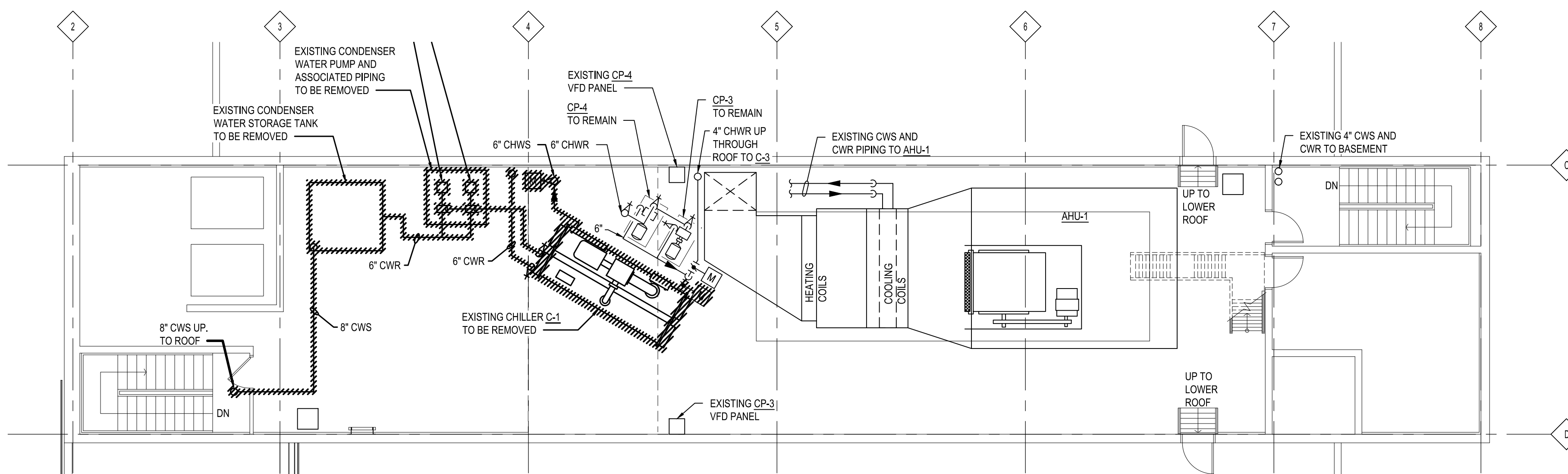
S = SUPPLIER (MANUFACTURER)	C = CHILLER	* - ITEMS INDICATED AS SUPPLIER SHALL BE PROVIDED WITH THE ITEM/ EQUIPMENT OR BY THE CONTRACTOR PURCHASING THE ITEM/EQUIPMENT
M = MECHANICAL	CP = CHILLED WATER PUMP	
E = ELECTRICAL		
VFD = VARIABLE FREQUENCY DRIVE		



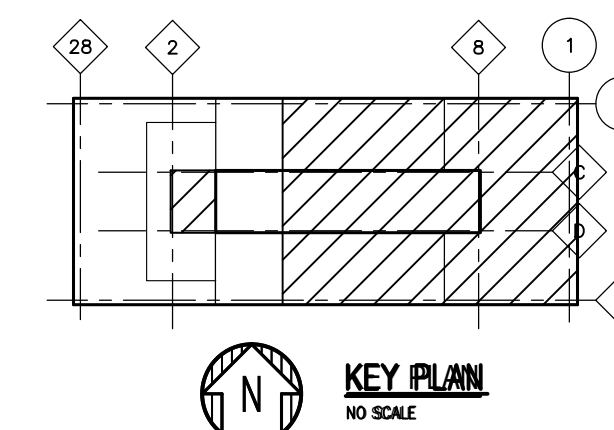
PENTHOUSE ROOF PLAN - DEMOLITION
 SCALE: 1/8" = 1'-0"
 0 4 8 16 32



UPPER PENTHOUSE FLOOR PLAN - DEMOLITION
 SCALE: 1/8" = 1'-0"
 0 4 8 16 32



LOWER PENTHOUSE FLOOR PLAN - DEMOLITION
 SCALE: 1/8" = 1'-0"
 0 4 8 16 32

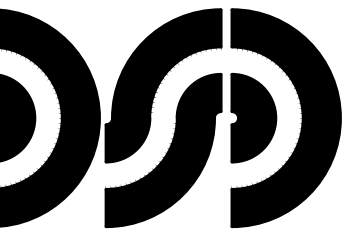


DEMOLITION GENERAL NOTES

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

PENTHOUSE FLOOR & ROOF DEMOLITION PLANS

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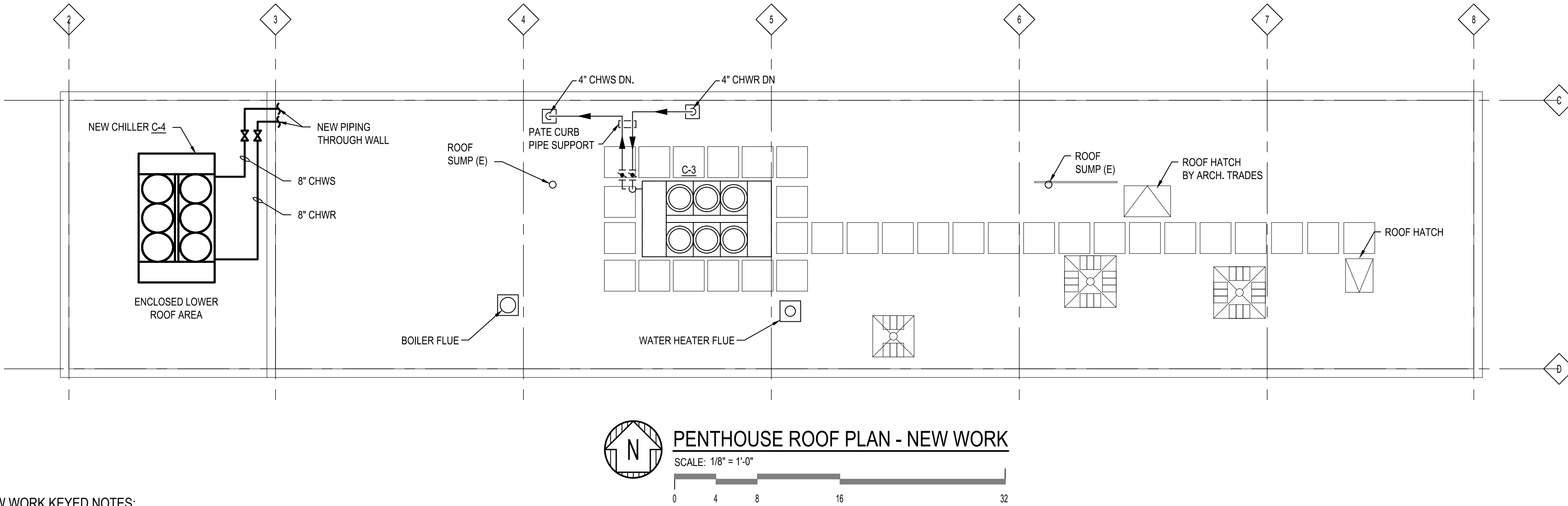
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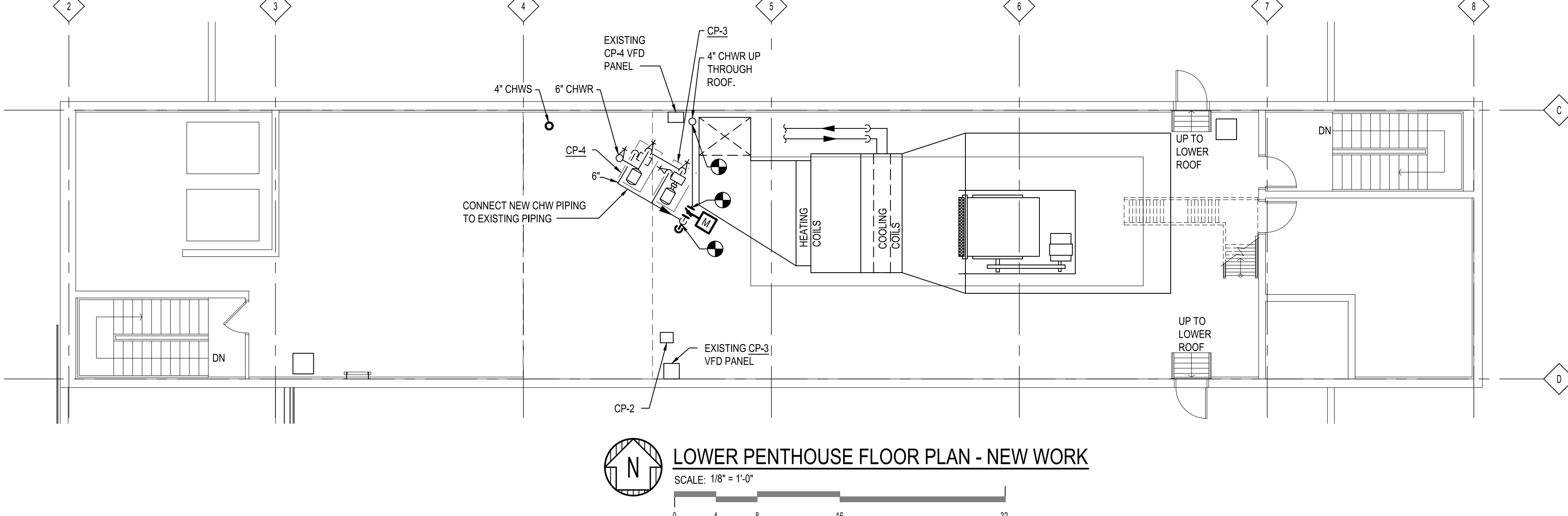
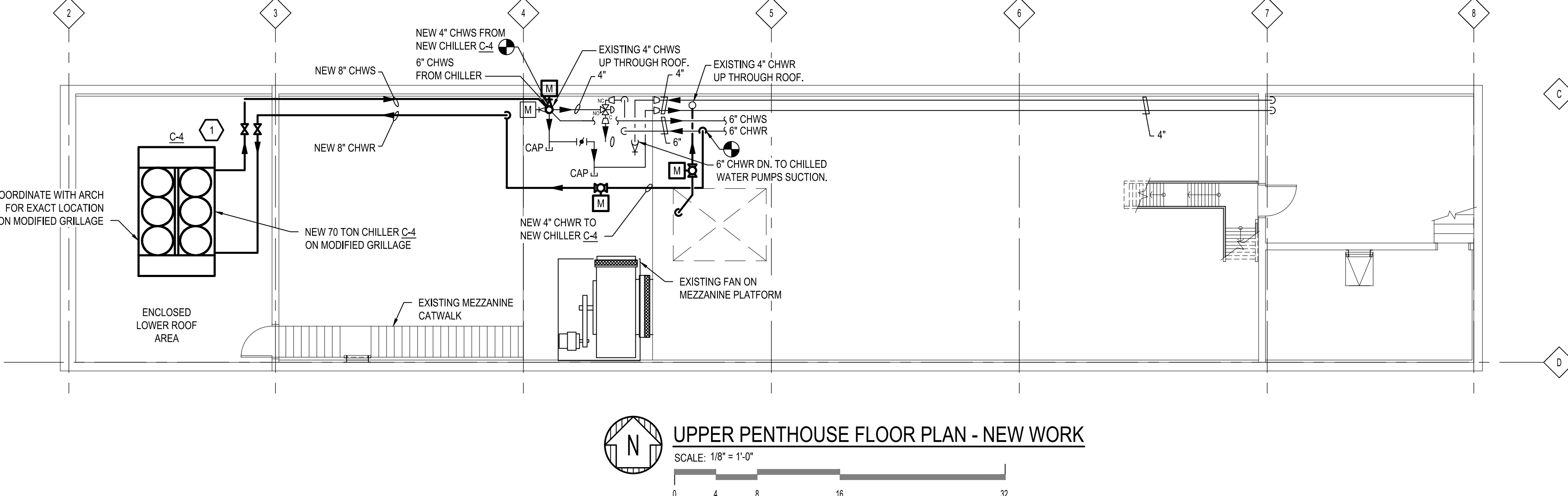
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M-2



NEW WORK KEYED NOTES:
(APPLICABLE THIS SHEET ONLY)

1 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**
- 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.
 - THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
 - COORDINATE ROOF PENETRATION LOCATIONS WITH ARCHITECTURAL AND STRUCTURAL TRADES.
 - FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
 - PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
 - 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:

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 AS/JSLII.

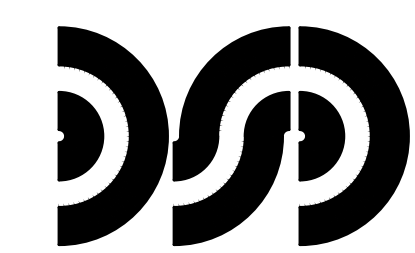
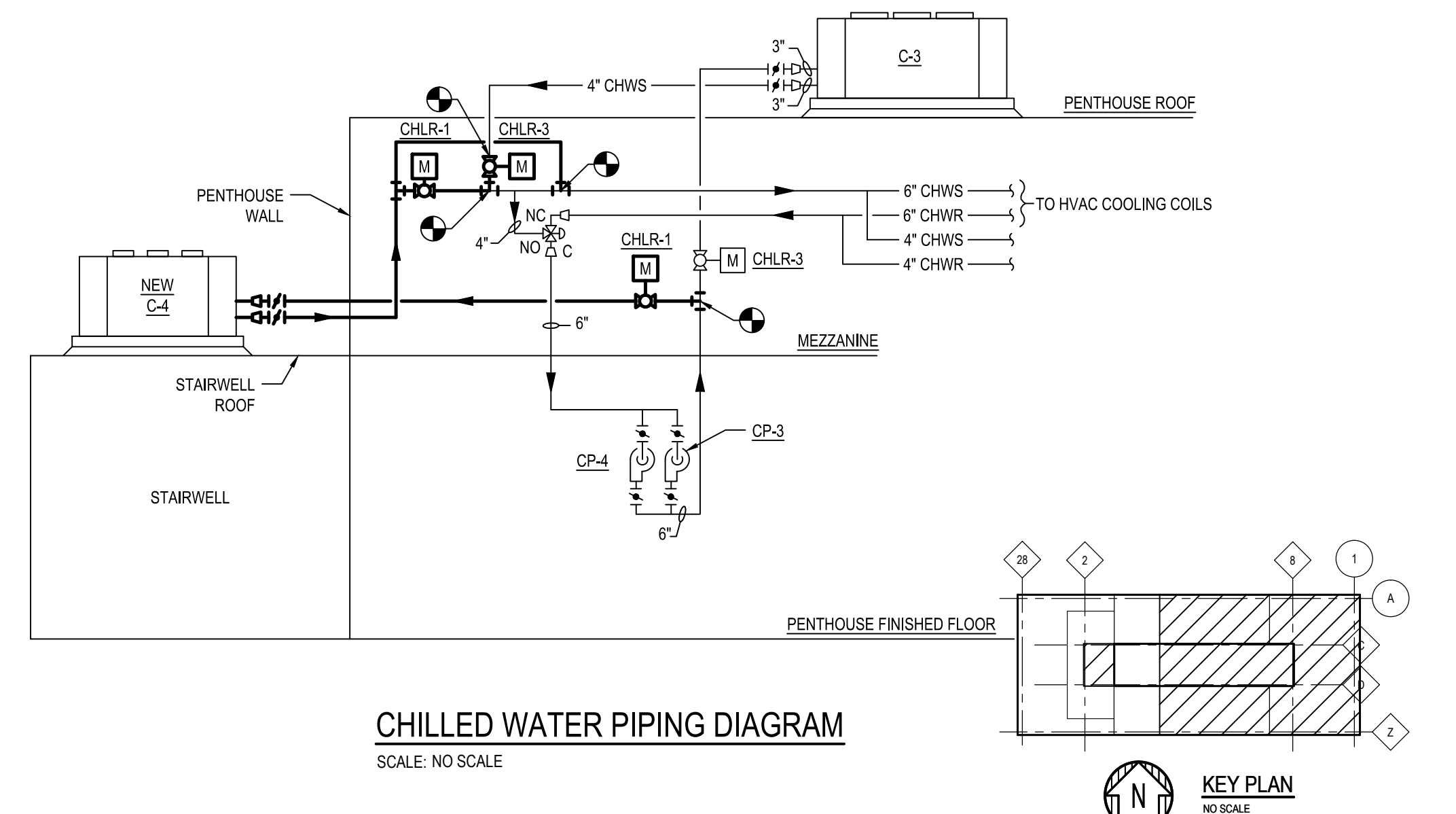
OUTDOOR SAME AS ABOVE EXCEPT 1-1/2" THICK AND WITH PVC WATERPROOF INSULATION JACKETING. MANUFACTURER: ZESTON; CEECO; PROTO.

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 POWER.
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-FINISHED 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.
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.

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.
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 PSIG (414 KPA), RANGE: 10 TO 125 PSIG (69 TO 862 KPA); 150 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 BELLOW OPERATE TO ACTUATE A SPDT SNAP SWITCH.
ELECTRICAL CONNECTIONS: SCREW TERMINAL.
ENCLOSURE CONDUIT CONNECTION: KNOCK OUT OR THREADED CONNECTION.
USER INTERFACE: HUMDBSCREW SET-POINT ADJUSTMENT WITH ENCLOSED SET-POINT INDICATOR AND SCALE.
HIGH AND LOW PRESSURE 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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ACADFILE: 18-130-M-3
PROJECT No. **18-1304**

POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC	
	AI	AO	BI	BO	AV	BV	LOOP	SCHED	TREND	ALARM			
MAIN CHILLED WATER RETURN TEMP	X								X			X	
MAIN CHILLED WATER SUPPLY TEMP	X								X			X	
OUTSIDE AIR TEMP					X							X	
CHILLER 3 FAILURE										X		X	
CHILLER 4 FAILURE										X		X	
HIGH MAIN CHILLED WATER RETURN TEMP										X		X	
HIGH MAIN CHILLED WATER SUPPLY TEMP										X		X	
LEAD CHILLER FAILURE										X		X	
LOW MAIN CHILLED WATER RETURN TEMP										X		X	
LOW MAIN CHILLED WATER SUPPLY TEMP										X		X	
CHILLED WATER DIFFERENTIAL PRESSURE	X								X			X	
CHILLED WATER FLOW	X								X			X	
CHILLED WATER RETURN TEMP	X								X			X	
CHILLED WATER SUPPLY TEMP	X								X			X	
CHILLED WATER BYPASS VALVE		X							X			X	
CHILLED WATER PUMP 3 VFD SPEED		X							X			X	
CHILLED WATER PUMP 4 VFD SPEED		X							X			X	
CHILLED WATER ISOLATION VALVE STATUS			X						X			X	
CHILLED WATER PUMP 3 STATUS		X							X			X	
CHILLED WATER PUMP 3 VFD FAULT		X							X			X	
CHILLED WATER PUMP 4 STATUS		X							X			X	
CHILLED WATER PUMP 4 VFD FAULT		X							X			X	
CHILLER STATUS		X							X			X	
EMERGENCY SHUTDOWN		X							X	X		X	
CHILLED WATER ISOLATION VALVE			X									X	
CHILLED WATER PUMP 3 START/STOP			X						X			X	
CHILLED WATER PUMP 4 START/STOP			X						X			X	
CHILLER 3 ENABLE			X									X	
CHILLER 4 ENABLE			X									X	
CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT				X					X			X	
CHILLED WATER FLOW SETPOINT				X					X			X	
OUTSIDE AIR TEMP					X							X	
OUTSIDE AIR TEMP					X							X	
CHILLED WATER VALVE 1 FAILURE										X		X	
CHILLED WATER VALVE 1 IN HAND										X		X	
CHILLED WATER VALVE 1 RUNTIME EXCEEDED										X		X	
CHILLED WATER VALVE 2 FAILURE										X		X	
CHILLED WATER VALVE 2 IN HAND										X		X	
CHILLED WATER VALVE 2 RUNTIME EXCEEDED										X		X	
CHILLED WATER VALVE 3 FAILURE										X		X	
CHILLED WATER VALVE 3 IN HAND										X		X	
CHILLED WATER VALVE 3 RUNTIME EXCEEDED										X		X	
CHILLED WATER VALVE 4 FAILURE										X		X	
CHILLED WATER VALVE 4 IN HAND										X		X	
CHILLED WATER VALVE 4 RUNTIME EXCEEDED										X		X	
CHILLED WATER PUMP 3 FAILURE										X		X	
CHILLED WATER PUMP 3 IN HAND										X		X	
CHILLED WATER PUMP 3 RUNTIME EXCEEDED										X		X	
CHILLED WATER PUMP 4 FAILURE										X		X	
CHILLED WATER PUMP 4 IN HAND										X		X	
CHILLED WATER PUMP 4 RUNTIME EXCEEDED										X		X	
CHILLER FAILURE										X		X	
CHILLER RUNNING IN HAND										X		X	
CHILLER RUNTIME EXCEEDED										X		X	
HIGH CHILLED WATER DIFFERENTIAL PRESSURE										X		X	
HIGH CHILLED WATER SUPPLY TEMP										X		X	
LOW CHILLED WATER DIFFERENTIAL PRESSURE										X		X	
LOW CHILLED WATER FLOW										X		X	
LOW CHILLED WATER SUPPLY TEMP										X		X	
TOTALS	6	3	7	4	4	0	0	0	18	36		27	
	TOTAL HARDWARE (20)				TOTAL SOFTWARE (58)								

CHW CONTROL SEQUENCE:

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 CONTROLS

CHILLER LEAD/STANDBY OPERATION:
 THE TWO CHILLER TRAINS, EACH CHILLER AND ITS ASSOCIATED SUPPORT EQUIPMENT(S), 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.

ALARMS WILL BE PROVIDED AS FOLLOWS:
 CHILLER-3 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 CHILLER-4 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 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 55°F (ADJ.).
 LOW MIN CHILLED WATER SUPPLY TEMP: IF THE MAIN CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).
 HIGH MAIN CHILLED WATER RETURN TEMP: IF THE MAIN CHILLED WATER RETURN TEMPERATURE IS GREATER THAT 65°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 ON.
 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 ON.
 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 VFD'S MINIMUM SPEED WILL NOT DROP BELOW 20% (ADJ.).

AIR COOLED CHILLER (TYPICAL OF 2)
 CHILLER - RUN CONDITIONS:
 THE CHILLER SHALL BE ENABLED TO RUN WHENEVER THE 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 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.

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.

• 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 (ADJ.).

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
 MONTHLY

ALARMS SHALL BE PROVIDED AS FOLLOWS:
 CHILLED WATER PUMP 1 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.
 CHILLED 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.
 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 SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12LB/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.

CHILLER:
 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 SEQUENCING.

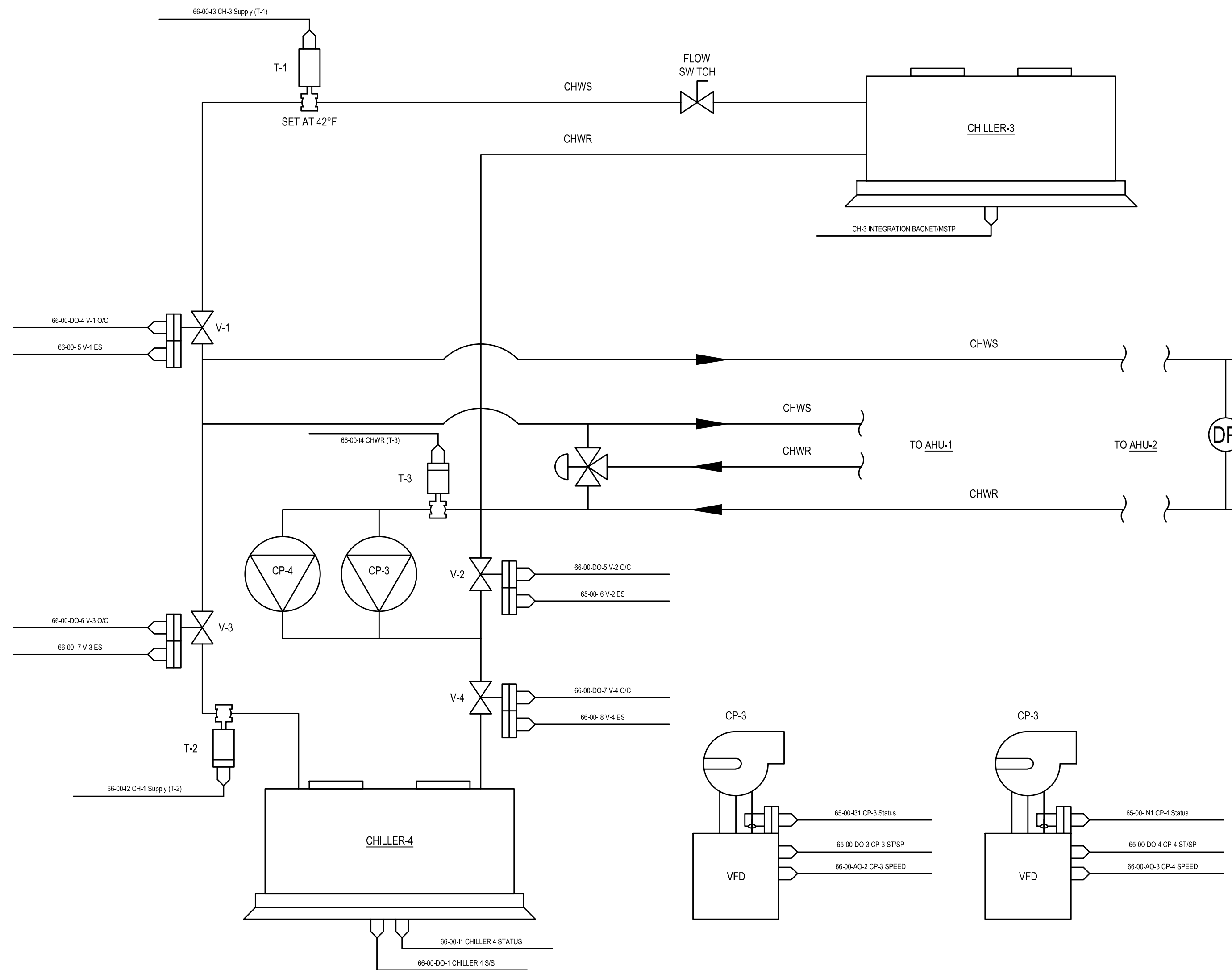
THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

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

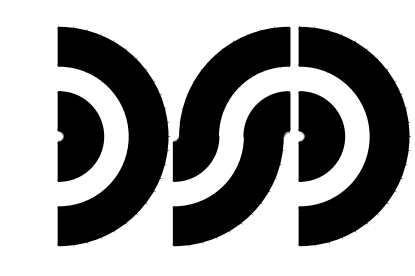
CHILLED WATER TEMPERATURE MONITORING:
 THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
 CHILLED WATER SUPPLY.
 CHILLED WATER RETURN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
 HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
 LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).



CHW SYSTEM

SCALE: NO SCALE



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

CHW CONTROL SEQUENCE

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

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

M-4

HW CONTROL POINTS SCHEDULE

POINT NAME	HARDWARE POINTS				SOFTWARE POINTS						SHOW ON GRAPHIC	
	AI	AO	BI	BO	AV	BV	LOOP	SCHED	TREND	ALARM		
BOILER 1 HOT WATER RETURN TEMP	X								X		X	
BOILER 1 HOT WATER SUPPLY TEMP	X								X		X	
BOILER 2 HOT WATER RETURN TEMP	X				X				X		X	
BOILER 2 HOT WATER SUPPLY TEMP	X								X		X	
BOILER 3 HOT WATER RETURN TEMP	X								X		X	
BOILER 3 HOT WATER SUPPLY TEMP	X								X		X	
HOT WATER DIFFERENTIAL PRESSURE	X								X		X	
PRIMARY HOT WATER RETURN TEMP	X								X		X	
PRIMARY HOT WATER SUPPLY TEMP	X								X		X	
HOT WATER PUMP 1 VFD SPEED		X							X		X	
HOT WATER PUMP 2 VFD SPEED		X							X		X	
HOT WATER PUMP 3 VFD SPEED		X							X		X	
HOT WATER PUMP 4 VFD SPEED		X							X		X	
BOILER 1 ALARM STATUS			X						X		X	
BOILER 1 LOW WATER LEVEL			X						X	X	X	
BOILER 1 STATUS			X						X		X	
BOILER 2 ALARM STATUS			X						X		X	
BOILER 2 LOW WATER LEVEL			X						X	X	X	
BOILER 2 STATUS			X						X		X	
BOILER 3 ALARM STATUS			X						X		X	
BOILER 3 LOW WATER LEVEL			X						X	X	X	
BOILER 3 STATUS			X						X		X	
HOT WATER PUMP 1 STATUS			X						X		X	
HOT WATER PUMP 2 STATUS			X						X		X	
HOT WATER PUMP 3 STATUS			X						X		X	
HOT WATER PUMP 4 STATUS			X						X		X	
HOT WATER PUMP 4 VFD FAULT			X						X		X	
HOT WATER PUMP 1 VFD FAULT			X						X		X	
HOT WATER PUMP 2 VFD FAULT			X						X		X	
HOT WATER PUMP 3 VFD FAULT			X						X		X	
HOT WATER PUMP 4 VFD FAULT			X						X		X	
BOILER 1 ENABLE				X							X	
BOILER 2 ENABLE				X							X	
BOILER 3 ENABLE				X							X	
HOT WATER PUMP 1 START/STOP				X							X	
HOT WATER PUMP 2 START/STOP				X							X	
HOT WATER PUMP 3 START/STOP				X							X	
HOT WATER PUMP 4 START/STOP				X							X	
HOT WATER DIFFERENTIAL PRESSURE SETPOINT					X				X		X	
OUTSIDE AIR TEMP					X							
BOILER 1 FAILURE										X		
BOILER 1 HIGH HOT WATER SUPPLY TEMP										X		
BOILER 1 LOW HOT WATER SUPPLY TEMP										X		
BOILER 1 RUNNING IN HAND										X		
BOILER 1 RUNTIME EXCEEDED										X		
BOILER 2 FAILURE										X		
BOILER 2 HIGH HOT WATER SUPPLY TEMP										X		
BOILER 2 LOW HOT WATER SUPPLY TEMP										X		
BOILER 2 RUNNING IN HAND										X		
BOILER 2 RUNTIME EXCEEDED										X		
BOILER 3 FAILURE										X		
BOILER 3 HIGH HOT WATER SUPPLY TEMP										X		
BOILER 3 LOW HOT WATER SUPPLY TEMP										X		
BOILER 3 RUNNING IN HAND										X		
BOILER 3 RUNTIME EXCEEDED										X		
HIGH HOT WATER DIFFERENTIAL PRESSURE										X		
HIGH PRIMARY HOT WATER SUPPLY TEMP										X		
HOT WATER PUMP 1 FAILURE										X		
HOT WATER PUMP 1 RUNNING IN HAND										X		
HOT WATER PUMP 1 RUNTIME EXCEEDED										X		
HOT WATER PUMP 2 FAILURE										X		
HOT WATER PUMP 2 RUNNING IN HAND										X		
HOT WATER PUMP 2 RUNTIME EXCEEDED										X		
HOT WATER PUMP 3 FAILURE										X		
HOT WATER PUMP 3 RUNNING IN HAND										X		
HOT WATER PUMP 3 RUNTIME EXCEEDED										X		
HOT WATER PUMP 4 FAILURE										X		
HOT WATER PUMP 4 RUNNING IN HAND										X		
HOT WATER PUMP 4 RUNTIME EXCEEDED										X		
LEAD BOILER FAILURE										X		
LOW HOT WATER DIFFERENTIAL PRESSURE										X		
LOW PRIMARY HOT WATER SUPPLY TEMP										X		
TOTALS	9	4	17	7	2	0	0	0	27	39	38	
TOTAL HARDWARE (33)					TOTAL SOFTWARE (62)							

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 65F (ADJ.) TO PREVENT CYCLING, 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 38F (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 LOW WATER LEVEL 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

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 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 FOLLOWING 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 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

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. VFD FAULT.

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 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 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 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. 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 150F (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 20F ABOVE SETPOINT, THE LAG BOILER SHALL STAGE OFF. THE DESIGNATED LEAD BOILER SHALL ROTATE UPON ONE OF 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.

BOILER 2: 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

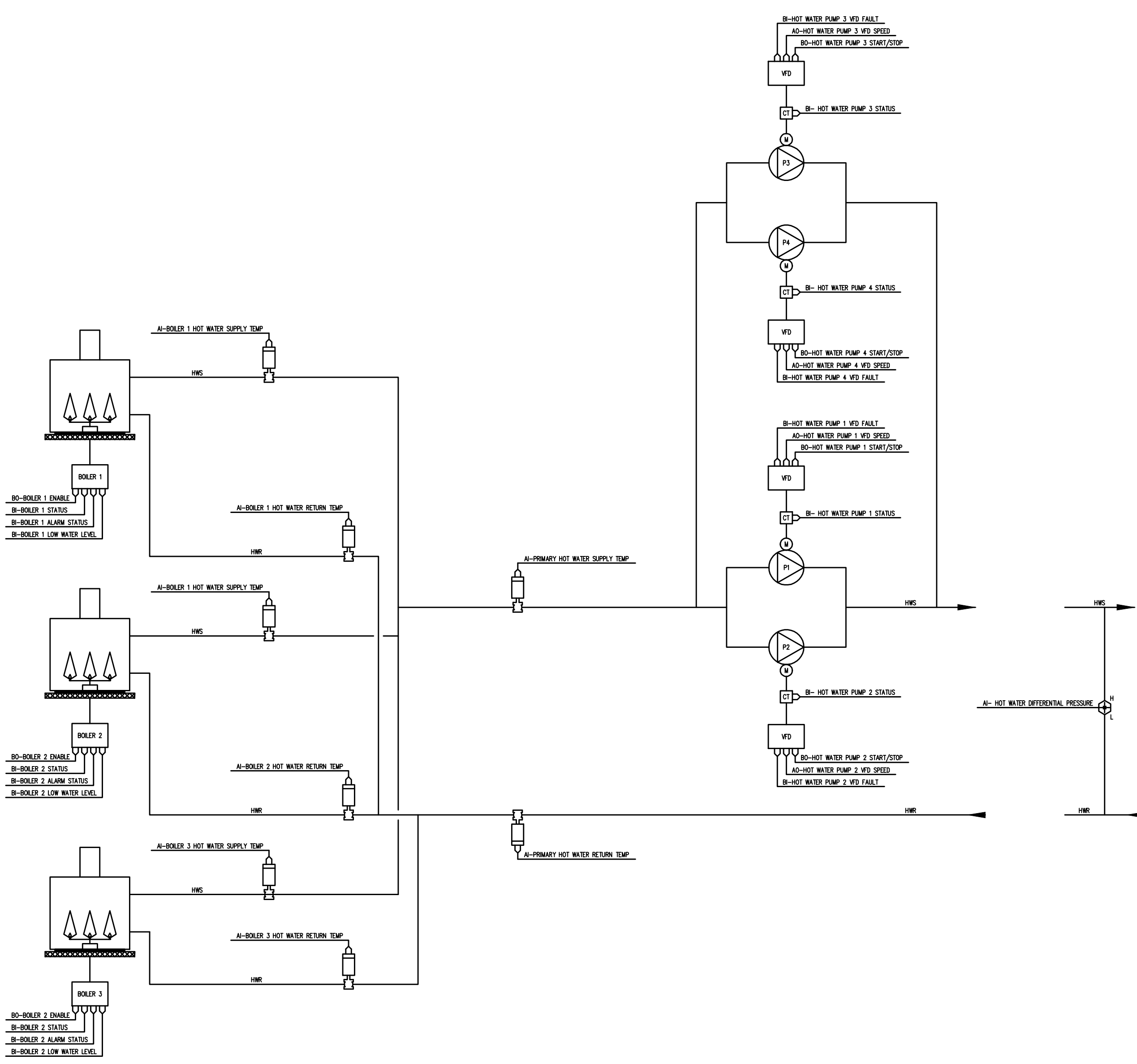
ALARMS SHALL BE PROVIDED AS FOLLOWS: HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER THAN 200F (ADJ.). LOW PRIMARY HOT WATER SUPPLY TEMP: IF LESS THAN 100F (ADJ.).

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

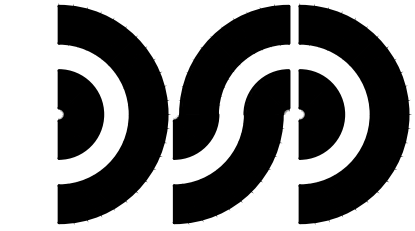
ALARMS SHALL BE PROVIDED AS FOLLOWS: HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER THAN 200F (ADJ.). LOW PRIMARY HOT WATER SUPPLY TEMP: IF LESS THAN 100F (ADJ.).

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 200F (ADJ.). LOW PRIMARY HOT WATER SUPPLY TEMP: IF LESS THAN 100F (ADJ.).



HW SYSTEM
SCALE: NO SCALE



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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
BIDS	03/20/19

DESIGNER:	MJB
DRAWN:	DMN
PM / PIC:	JSR/BJR
CHECKED:	DCM
ACADFILE:	18-1304-M-5
PROJECT No.:	18-1304

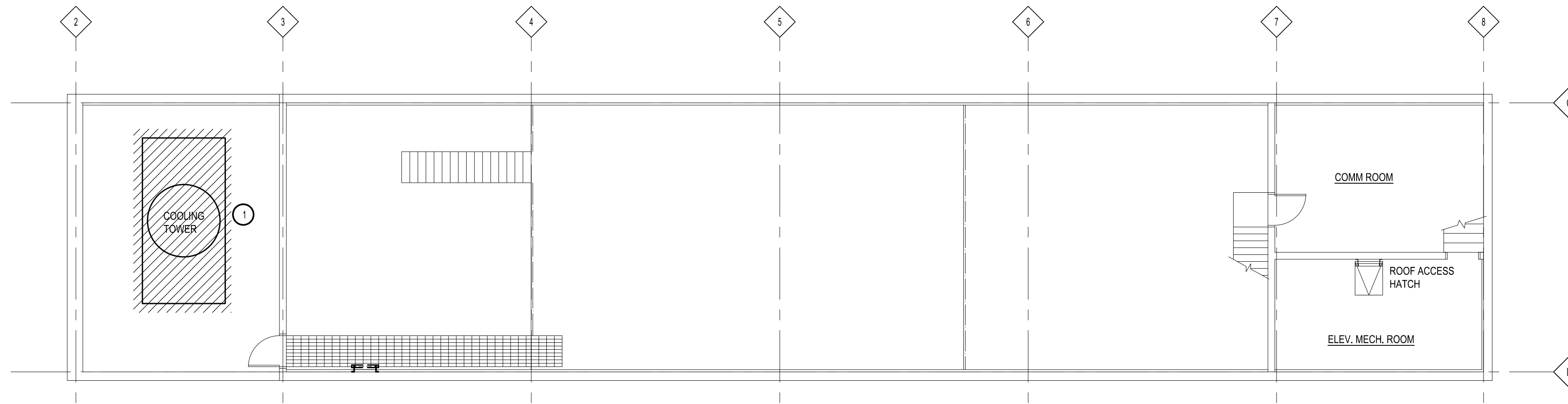
M-5

ELECTICAL DEMOLITION GENERAL NOTES

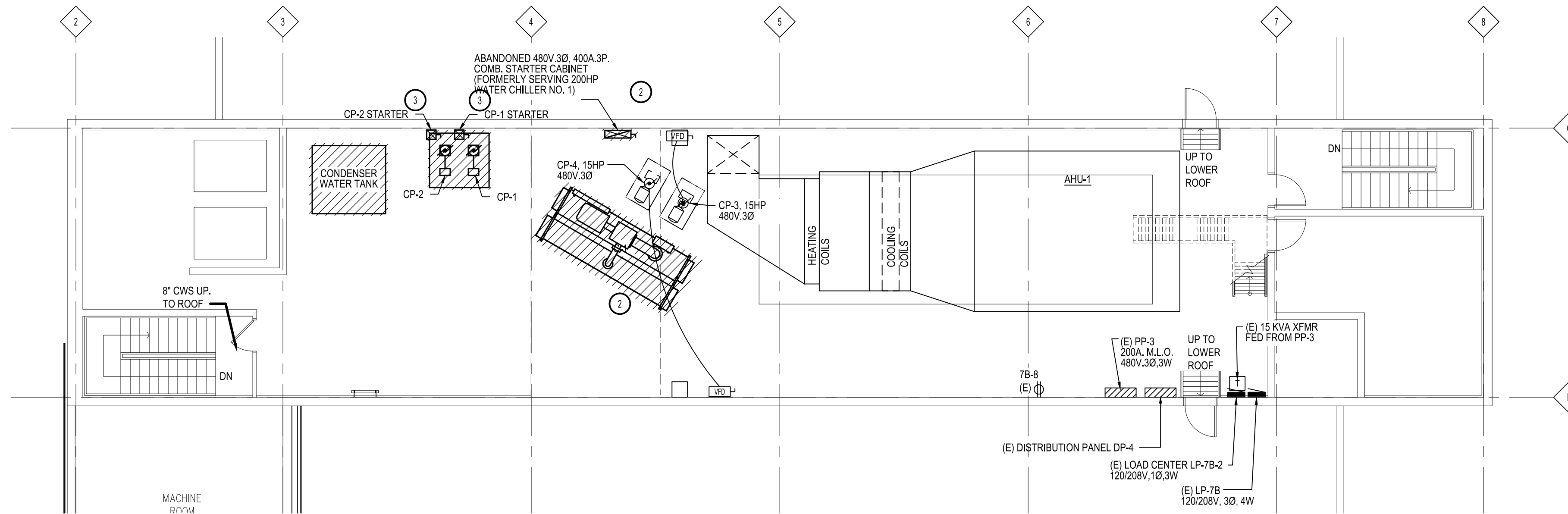
1. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
2. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT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

DEMOLITION KEY NOTES:
(APPLICABLE THIS SHEET ONLY)

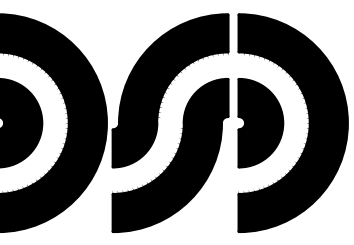
1. DISCONNECT AND REMOVE SERVICE TO EXISTING COOLING TOWER BACK TO SOURCE.
2. REMOVE ABANDONED STARTER FORMERLY SERVING WATER-COOLED CHILLER C-1, AND ASSOCIATED FEEDER.
3. DISCONNECT AND REMOVE SERVICES TO CONDENSER WATER PUMPS CP-1 AND CP-2 BACK TO SOURCE IN THEIR ENTIRETY.



UPPER PENTHOUSE FLOOR PLAN - DEMOLITION
SCALE: 1/8" = 1'-0"
0 4 8 16 32



LOWER PENTHOUSE FLOOR PLAN - DEMOLITION
SCALE: 1/8" = 1'-0"
0 4 8 16 32



**DiClemente
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**LARCOM CHILLER
REPLACEMENT PROJECT**
ANN ARBOR, MI

**ELECTRICAL
PENTHOUSE & ROOF
DEMOLITION PLANS**
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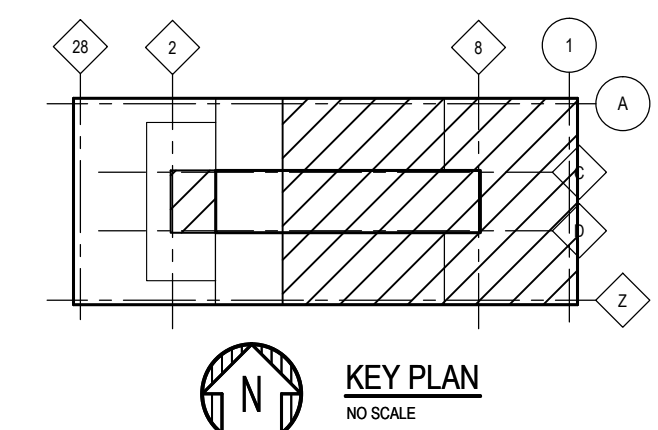
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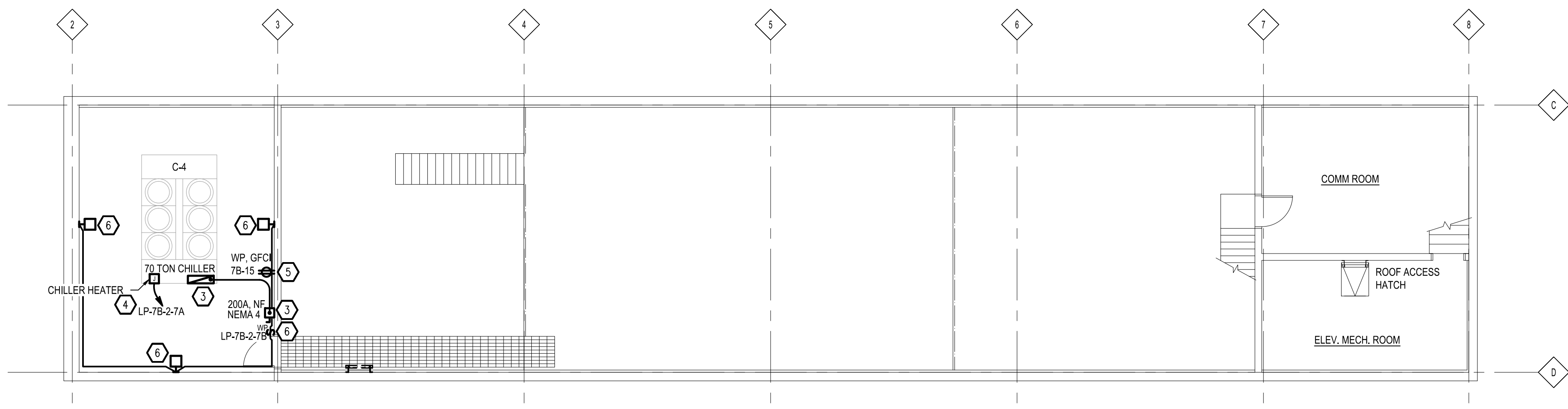
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ISSUED FOR	DATE
OWNER REVIEW	02/08/19
BIDS	03/20/19

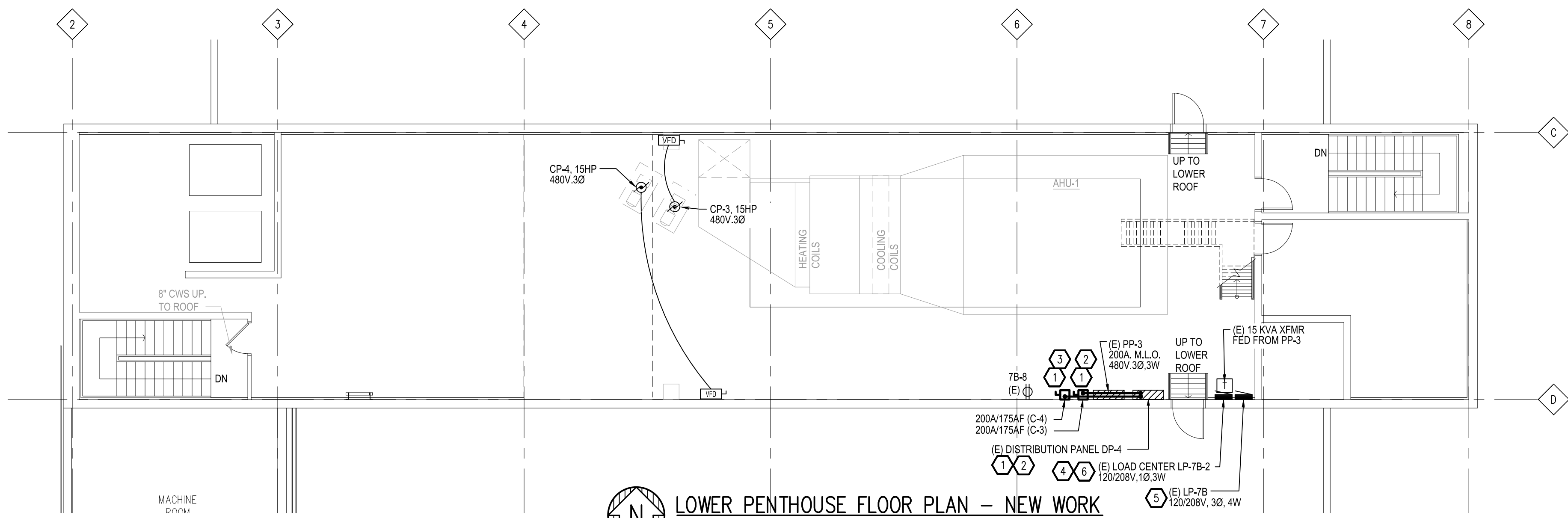
DESIGNER:	JCO
DRAWN:	JMW
PM / PIC:	JSR/BJR
CHECKED:	SM
ACADFILE:	18-1304-E-2
PROJECT No.	18-1304

E-2





UPPER PENTHOUSE FLOOR PLAN - NEW WORK
 SCALE: 1/8" = 1'-0"
 0 4 8 16 32



LOWER PENTHOUSE FLOOR PLAN - NEW WORK
 SCALE: 1/8" = 1'-0"
 0 4 8 16 32

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 ANY WORK.
3. ALL WORK TO BE DONE IN ACCORDANCE WITH THE 2017 NATIONAL ELECTRICAL CODE.

NEW WORK KEY NOTES:
 (APPLICABLE THIS SHEET ONLY)

1. PROVIDE TWO 200A, 3-POLE FUSIBLE NEMA 1 SWITCHES FOR SERVICE TO EXISTING AIR-COOLED 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.
2. REWORK EXISTING C-3 FEEDER FROM DP-4 TO NEW 200A SWITCH ADJACENT TO DP-4.
3. 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.
4. PROVIDE 120V, 20A BRANCH CIRCUIT FOR AIR-COOLED CHILLER C-4 HEATING CIRCUIT, 2#12 & #12 GND, 3/4". FROM LOAD CENTER LP-7B-2. PROVIDE 2020A SQUARE D TYPE QO TANDEM BREAKER IN EXISTING SPACE NO. 7.
5. PROVIDE 120V, 20A GFCI DUPLEX OUTLET WITH WEATHER-PROOF WHILE-IN-USE COVER AND ASSOCIATED BRANCH CIRCUIT, 2#12 & #12 GND, 3/4". 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 DOBXD WITH DLL127F1,5,1U PHOTOCELL, OR EQUAL. PROVIDE WP LOCAL WALL-MOUNTED SWITCH AND BRANCH CIRCUIT TO LOAD CENTER LP-7B-2.

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LARCOM CHILLER REPLACEMENT PROJECT
 ANN ARBOR, MI

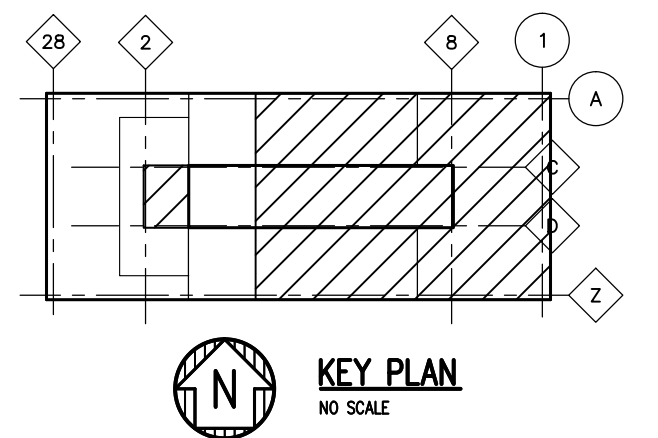
ELECTRICAL PENTHOUSE FLOOR & ROOF NEW WORK PLANS
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ISSUED FOR	DATE
OWNER REVIEW	02/08/19
BIDS	03/20/19

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



ELECTRICAL GENERAL NOTES

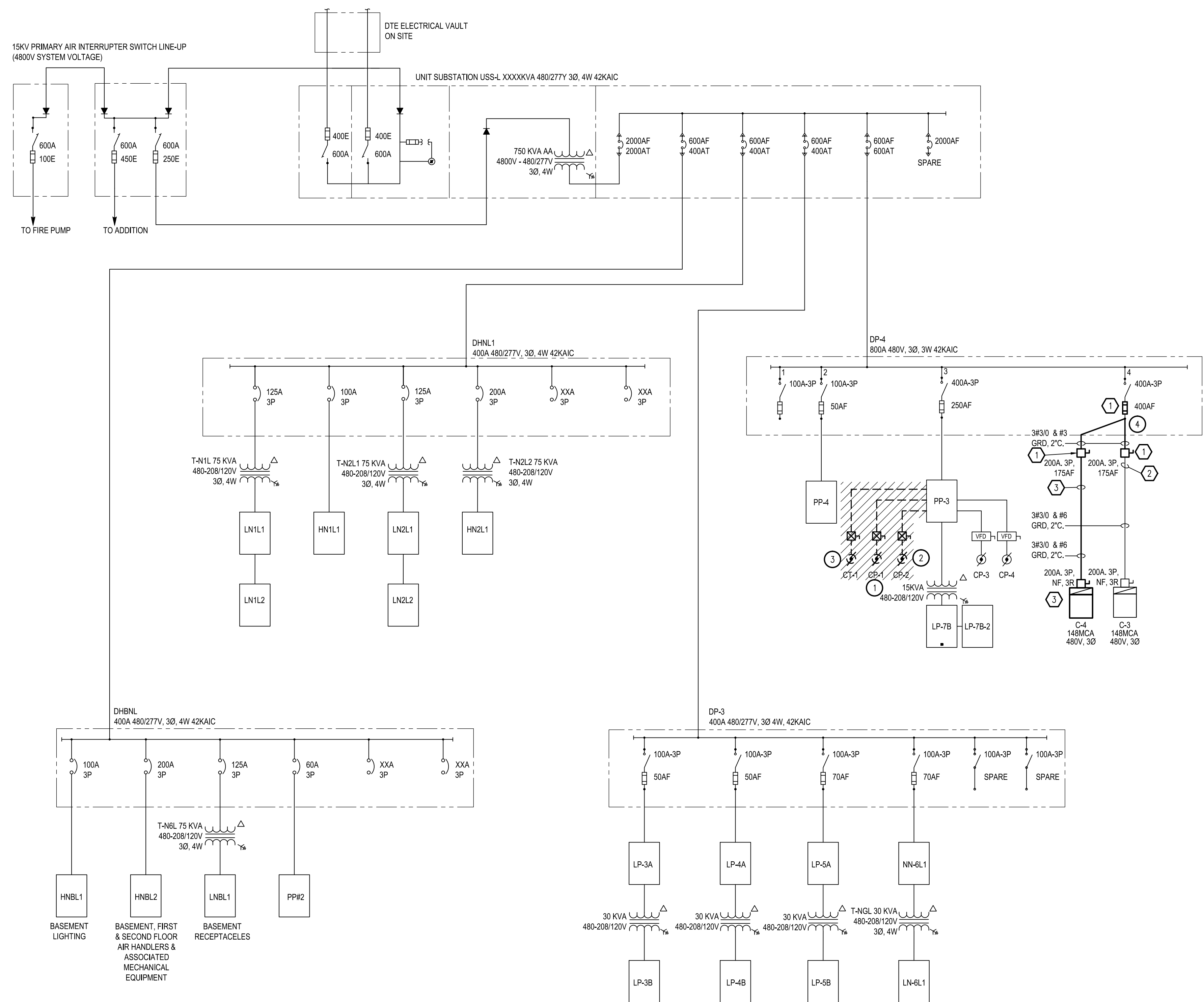
- 1. THESE DRAWINGS ARE DIAGRAMMATIC & INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE PIPING SYSTEMS COMPLETE AND PER SPECIFICATIONS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, AND FITTINGS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR OTHER CONDITIONS.
- 2. CONTRACTOR SHALL COORDINATE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

DEMOLITION KEY NOTES:

- ① 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.
- ② 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.
- ③ 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.
- ④ 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:

- ① 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.
- ② REWORK FEEDER FROM CHILLER C-3 TO NEW 200A FUSIBLE SWITCH. FUSE SWITCH AT 175A.
- ③ 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.



1 ONE-LINE DIAGRAM
0 4 8 16 32

120/208 VOLT-3PHASE-4WIRE+GRND PANELBOARD SCHEDULE

Ckt No	VA	LOAD TYPE	A	B	C	LOAD TYPE	VA	Ckt No
1		SPACE				SPACE		2
3		SPACE				SPACE		4
5		SPACE				SPACE		6
7		LIGHTING				RECEPTACLES WEST - BOILER		8
9		LIGHTING				RECEPTACLES WEST - AC		10
11		LIGHTS - WEST ELEV ROOM				RECEPTACLES - RADIO ROOM & INCINERATOR		12
13		LIGHTS - RADIO ROOM & INCINERATOR ROOM				RECEPTACLES EAST, NORTH & SOUTH		14
15		ROOF TOP RECEPTACLES AT CHILLERS C-3 AND C-4				WATER CONDITIONER		16
17		LIGHTS - AHU				HOT WATER HEATER		18
19		NOVAR PANEL				FILTER MOTOR		20
21		TECOGEN CHILLER				208V RECEPTACLE		22
23							1884	24

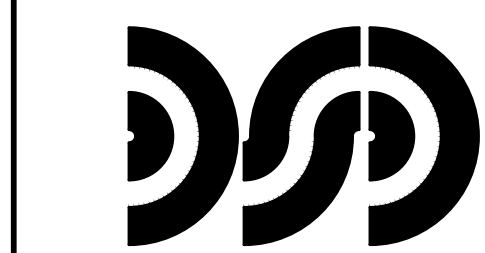
LIGHTING _____ VA AT 100% = _____ VA
RECEPTACLE _____ VA AT 100% = 10000 VA (FIRST 10,000 VA AT 100%)
RECEPTACLE _____ VA AT 50% = _____ VA
MISC. _____ VA AT _____% = _____ VA
TOTAL _____ VA TOTAL DEMAND = _____ VA / 208V = _____ A

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

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

Ckt No	VA	LOAD TYPE	L1	L2
1		SPACE (DO NOT USE)		
2		EXISTING LOAD	20	20
3		EXISTING LOAD	20	20
4		EXISTING LOAD	20	20
5		EXISTING LOAD	20	20
6A		PUMPS	20	20
6B		EXISTING LOAD	20	20
7A		C-4 FREEZE PROTECTION	20	20
7B		EXTERIOR LIGHT AT CHILLER C-4	20	20
8		SPACE (DO NOT USE)		

LIGHTING _____ VA AT 100% = _____ VA
RECEPTACLE _____ VA AT 100% = 10000 VA (FIRST 10,000 VA AT 100%)
RECEPTACLE _____ VA AT 50% = _____ VA
MISC. _____ VA AT _____% = _____ VA
TOTAL _____ VA TOTAL DEMAND = _____ VA / 120V = _____ A



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

**ELECTRICAL
DEMOLITION AND
NEW WORK
ONE-LINE DIAGRAM**
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ISSUED FOR	DATE
OWNER REVIEW	02/08/19
BIDS	03/20/19

DESIGNER: JCO
DRAWN: JMW
PM / PIC: JSR/BJR
CHECKED: SM
ACADFILE: 18-1304-E-4
PROJECT No: 18-1304