

NORTHWESTERN UNIVERSITY
PROJECT NAME _____
JOB # _____

FOR: _____
ISSUED: 03/29/2017

SECTION 23 7313 " PAC A! ED \$MODU#AR% AIR HAND#IN! UNITS

PART 1 " ! ENERA#

1&1 SECTION INC#UDES

A& O'()***+ , -)/*+ .-)**+ / *)'0,+ ,.+ 1, -)0.-2 ' -(3 , -) 4* / 5* -6-(3 ,3 3416)'06) , -) 31*7- *-
)+, 7.-23&

1&2 RE#ATED DOCUMENTS

A& D+, 7.-23 , -) 26-6+,0 5+*8.3.*-3 *9 (16 C*-(+,4(

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F& T+, 5 16.21(+6A'.+6 / 6-(3

B& T16 M641, -.4, 0 C* -(+, 4(*+ 31, 00 >6 +635*-3.>06 9*+ 4*3(3 .-4'+6) >; (16 !6-6+, 0
C* -(+, 4(*+: S'>4* -(+, 4(*+3: , -) C* -3'0(-.2 E-2.-66+3 (* , 44* / / *), (6 ' -(3 9'+-.316) >; ,
/ , - '9, 4('+6+ *(16+ (1, - / , - '9, 4('+6+ - , / 6) , 3 >, 3.3 *9) 63.2-&

1&@ RATINGS AND CERTIFICATIONS

A& A.+ H, -) 0.-2 U-(3, 96(;: ET# *+ U# 199?

B& A.+ H, -) 0.-2 U-(6-6+2; '36: ASHRAE 90&1

C& F, -3: AMCA 210

D& A.+ C*.03: AHRI B10

E& A.+ H, -) 0.-2 U-(46+(.9.4, (. * - 5+*2+, / : ANSI/AHRI B30

F& F.0(6+ / 6) ., : ANSI/U# 900 0.3(6) C0, 33 I *+ C0, 33 II

I & C* -(+*0 7.+.-2: NEC 4*) 63 J ET# +6A'.+6 / 6-(3

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- 1& D63.2- C,04'0,(*-3: C,04'0,(6 +6A'.+6 / 6-(3 9*+ 36064(-2 8.>+,(.*- .3*0,(+3 , -) 9*+)63.2--2 8.>+,(.*- .3*0,(.*- >,363&
- 2& 19 *'() **+: +**9 / *'-(6) '-(:)6(,0 / *'-(.-2: 364'+.-2: , -) 90,31.-2 *9 +**9 4'+> (* +**9 3(+ '4(+6& l-).4,(6 4**+).- ,(-2 +6A'.+6 / 6-(3 7.(1 +**9 / 6 / >+,-6 3;3(6 / &
- 3& W.-)"R63(+,-(D6(,03 \$.9 '-.(3'>H64((* 7.-)%

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I& W+,5 6A'.5 / 6-(: .-40').-2 6064(+.4, 0 4* / 5*-6-(3: 9*+ 5+*(64(. * - ,2,.-3(+,.-: 3- * 7: 7.-):).+(:
3' - 9,).-2: +* ,) 3, 0(/416 / .4, 03: + ' 3(, -) 4*++*3. * -& 665 6A'.5 / 6-(406, - , -))+;&

J& T,+5 * ' () **+ ' -(3 (* 5+*(64(,2,.-3(+,.- , -) +* ,)) 6>+.3) ' +.-2 31.55.-2&

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D& U-(7.00 31.5 .- *-6 \$1% 5.646 716-686+ 5*33.>0

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1& S(,.-0633 3(660 1.-263 56+ /.(, 1F0°) **+ 37.-2&

2& A44633) **+ 7.00 >6 *9 (16 3, / 6 / , (6+, 0 (;56 , 3 6E(6+. *+/- (6+. *+ 4, 3.-2&

3& A44633) **+ 0, (4163 7.00 '36 , +*006+ 4, / 0, (41.-2 / 641, -.3 / &

M& V.67 5*+(3 7.00 >6 3.-206 5, -6 P06E.20, 3&

N

E& D.34* --64(3 7.00 >6 5+*8.)6) 7.(1 , - .-(62+,0 2+*' -) 0' 2&
1& 1@A (* 100A).34* --64(3 7.00 1,86 (7* \$2% #1B 2+*' -) 7.+63&
2& 200A (* B00A).34* --64(3 7.00 1,86 *-6 \$1% #@"2?0 2+*' -) 7.+6&

2&7 ACROSS"THE"#INE FAN MOTOR STARTERS

A& C*-3(- (3566) / *(+ 3(+6+3 7.00 >6 9'+-.316) \$31.556) 0**36% *+ 5+*8.)6) \$9,4(*+; / *' -(6) , -) 7.+6) (* / *(+*% 7.(1 '-.(3: ,3 31*7- .- 3'> / .((,0) *4' / 6-(3&

B& F*+ *') **+ ' -(3: / *(+ 3(+6+3 7.00 >6 1* '36) .- ,)6).4,(6): 76,(16+ +63.3(- (4* / 5,+ / 6-(&

1& S1.556) 0**36 3(+6+3 , -) 3(+6+3 5+*8.)6) *- ' -(3 7.(1*' (3.-206 5* -(5*76+ 7.00 >6 1*'36) .- , NEMA 3R 6-40*3'+6&
2& W6,(16+5+*9 4* / 5,+ / 6-(3 7.00 >6 5+*8.)6) *- ' -(3 7.(1 3.-206 5* -(5*76+&

C& M*(+ 3(+6+ 5, -603 7.00 .-40') 6:

1& M,.- 5*76+ >0*4<
2& M*(+ 4* -(, 4(*+\$3%
3& I-).8.) ', 0 31*+(4.4' .(, -) *86+0* ,) 5+*(64(. *-
B& 120 8*0(4* -(+*0 5*76+ (+, -39*+ / 6+ 7.(1 5+ / ,+; , -) 364*- ,+; 5+*(64(. *-
?& ? 5* -((6+ / .- , 0 3(+5 9*+ 9.60) 4* --64(. *- 3
@& M,.- 5*76+).34* --64(
7& H, -)"O99"A' (* 37.(41

2&F FAN VARIAB#E FREDUENCY DRIVES

A& R696+ (* S64(. *- 23 0?1B GV, +., >06 F+6A' 6-4; D+.863 \$VFD%&G

B& V, +., >06 9+6A' 6-4;)+.863 7.00 >6 9'+-.316) \$31.556) 0**36% *+ 5+*8.)6) \$9,4(*+; / *' -(6) , -) 7.+6) (* / *(+*% 7.(1 '-.(3: ,3 31*7- .- 3'> / .((,0) *4' / 6-(3&

C& F*+ *') **+ ' -(3: VFD3 7.00 >6 1* '36) .- ,)6).4,(6): 76,(16+ +63.3(- (4* / 5,+ / 6-(&

1& S1.556) 0**36 VFD3 , -) VFD3 5+*8.)6) *- ' -(3 7.(1*' (3.-206 5* -(5*76+ 7.00 >6 1*'36) .- , NEMA 3R 6-40*3'+6&
2& W6,(16+5+*9 4* / 5,+ / 6-(3 7.00 >6 5+*8.)6) *- ' -(3 7.(1 3.-206 5* -(5*76+&

D& VFD3 9'+-.316) *+ 5+*8.)6) 7.(1 '-.(3 7.00 >6 5+*2+, / / 6) , -) 3(+6) >; ,)+.86 9,4(*+; , '(1*+.06) , -) (+, .-6) (641-.4., -&

2&9 HEATIN ! AND COO#IN ! COI#S

A& R696+ (* S64(. *- 23 F21@ GC*.03&G

B& C**0.-2 4*.0 362 / 6-(3 7.00 1,86 , 9'00"7.) (1 IAD)+, .- 5, - (1,(6E(6-)3 ,(06,3(@K) *7-3(+6, / *9 (16 0,3(4* .0 -(16 364(. *- &

C& C*.03 7.00 >6 +6 / *8, >06 9+* / (16 3.)6 *9 ' -(: 8., +6 / *8, >06 AHU 5, -603& N* / *+6 (1, - * -6 5, -60 / '3(>6 +6 / *86) (* +6 / *86 , 4*.0&

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D& C*.03 7.00 1,86 9+, / 63 4*-3(+ ' 4(6) *9 2,08, -.C6) 3(66& C,3.-2 41, --603 7.00 >6 9+66")+,.-.-2 , -))* -*(>0*4< 9.- ,+6,&

E& C**0.-2 4*.03 7.(1 9.--6) 16.21(2+6,(6+ (1,- BFK 7.00 1,86 , - .-(6+/6)..(6)+,.- 5,- 7.(1)*7-35*' ((*)+,.- 4*-)6-3,(6 (* / ,.-)+,.- 5,- & 1-(6+/6)..(6)+,.- 5,- / ,(6+,0 7.00 / ,(41 4*.0 9+, / 6 / ,(6+,&

F& C*.0 362 / 6-() **+ 406,+ , -463 7.00 ,00*7 9*+ ,(06,3(2".-4163 *9 9.60) .-3(,006) 5.5.-2 .-3'0,(.* -&

! & C*.0 >'0<16,)3 , -) >0,-<"*993 7.00 5+686-(,.+ 9+* / >;5,33.-2 4*.03&

H& C*.0 362 / 6-(4,3.-2 (* ,44* / / *), (6 9'00"9,46 *+

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B& F*+ / 6) 3(660 >, 36 +, .03 3' .(, >06 9*+ +.22.-2 , -) 0.9(-.2 7.00 >6 5+*8.)6): , 3
31*7 - * - 5+*) '4()+, 7.-23&

C& #.9(-.2 0' 23 7.00 >6 5+*8.)6) 716+6 +6A' .+6) 9*+ 5+*56+ 0.9(-.2&

PART 3 " EOEUCUTION

3&1 INSTA##ATION

- A& I-3(,00 6A'.5 / 6-(56+.-) '3(+; 3(, -),+): ,550.4,>06 4*)63: , -) / , - '9,4('+6+P3 .-3(+ '4(. * -3&
- B& D* -*('36 AHUI3 9*+ (6 / 5*+,+; 16,(.-2: 4**0.-2 *+ 86-(,0,(.* - 5+.*+ (* 4* / 506(6 .-3564(* - , -) 3(+,'5 56+9*+ / 6) 56+ (1.3 3564.9.4,(.* -&
- C& I-3(,00 AHUI3 * - , 4* -4+6(6 5,):+**9 4'+>: *+3(+ '4('+,0 3(660 >,36: ,3 31*7 - * -)+, 7.-23&
- D& I-3(,00 AHUI3 7.(1 / , - '9,4('+6+P3 +64* / / 6-)6) 406,+,-463 9*+ ,44633: 4*.0 5'00: , -) 9,- +6 / *8,0&
- E& P+*8.)6 * -6 4* / 506(6 36(*9 9.0(6+3 9*+ (63(-2: >,0, -4.-2: , -) 4* / / .33.*-.2& P+*8.)6 364* -) 4* / 506(6 36(*9 9.0(6+3 , (/ 6 *9 (+, -396+ (* *7-6&
- F& I-3(,00 AHUI3 50' / > , -) 06860& C*--64(5.5.-2 , -))'4(7*+< ,44*+).-2 (* / , - '9,4('+6+P3 .-3(+ '4(. * -3&
- I & I-3(,00 5.56 41,363 56+ / , - '9,4('+6+P3 .-3(+ '4(. * -3&
- H& I-3'0,(6 50' / >.-2 ,33*4.,(6) 7.(1)+,.- 5, -)+,.-3 , -) 4*--64(. * -3&
- I& I-3(,00 .-3'0,(.* - * - ,00 3(,226+6) 4*.0 5.5.-2 4* --64(* -3: >*(1 .-(6+-,0 , -) 6E(6+-,0 (* (16 ' -.(&

3&2 FIE#D DUA#ITY CONTRO#

- A& S(*+6 56+ AHU / , - '9,4('+6+P3 7+((6- +64* / / 6-),(* -3& S(*+6 AHU3 .-) **+3 .- , 7,+ / : 406, - :)+; 50,46 716+6 '-(3 7.00 >6 5+*(64(6) 9*+ / 76,(16+: 4*-3(+ '4(* - (+,99.4:).+(:)'3(: 7,(6+ , -) / *.3('+6& 19 '-(3 7.00 >6 3(*+6) 9*+ / *+6 (1,- @ / *- (13: 9*00*7 / , - '9,4('+6+P3 .-3(+ '4(. * - 9*+ 0*-2"(6+ / 3(*+,26&
- B& R.2 , -) 0.9('-(3 ,44*+).-2 / , - '9,4('+6+P3 .-3(+ '4(. * -3&

3&3 AHU INSPECTION

- A& H.+6 / , - '9,4('+6+P3 9,4(*+;"(+,-6) , -) 9,4(*+;"6 / 50*;6) 36+8.46 (641-.4., - (* 56+9*+ / , - .-3564(* - *9 '-(, -) .-3(,00,(.* - 5+.*+ (* 3(+,'5& T641-.4., - 31,00 .-3564(, -) 86+.9; (16 9*00*7.-2 ,3 , / .- / ' / :
- 1& D, / ,26 *9 , - ; <.-)
- 2& #6860 .-3(,00,(.* - *9 '-(
- 3& P+*56+ +6,336 / >0; , -) 36,0.-2 *9 '-(362 / 6-(3 , (31.55.-2 350.(3&
- B& T.21(36,0 ,+* ' -) 56+ / 6(6+ *9 '-(, ((16 +**9 4'+>
- ?& I-3(,00,(.* - *9 31.556)"0**36 5,+3(.-40') .-2 9.0(6+3: ,+ 1**)3: >+) 34+66-3 , -) / .3(60. / .- ,(*+3&
- @& C* / 506(* - , -) .21(-633 *9 6064(+.4,0:)'4(7*+< , -) 5.5.-2
- 7& T.21(36,03 ,+* ' -) 7.+.-2: 4* -)' .(, -) 5.5.-2 56-6(+,(.* -3 (1+* '21 AHU 4,3.-2&
- F& S'550; *9 6064(+.4.(; 9*+ / (16 >' .0) .-2P3 56+ / , -6-(3* ' +46
- 9& I-(62+.(; *9 4* -)6-3,(6 (+,5 9*+ 5*3.(.86 *+ -62,(.86 5+633'+6 *56+,(.* -
- 10& C* -)6-3,(6 (+,53 41,+26) 7.(1 7,(6+

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11& R6 / *8,0 *9 31.55.-2 >*0(3 , -) 31.55.-2 +63(+, .-(3
12& S6,0.-2 *9 5.56 41,36 90**+\$3% , (56-6(+, (. * - 0*4, (. * - 3&
13& T.21(-633 , -) 9'00 / *(. * - +, -26 *9) , / 56+ 0.-<,263 \$*56+, (6 / , - ' ,00;%
1B& C* / 506(6 .-3(,00, (. * - *9 4* -(+*0 3;3(6 / .-40').-2 6-))68.463 , -) 7.+.-2

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E& S'>/.(, 3(+('5 +65*(3' / / ,+C.-2 , - ; 5+*>06 / 3 9*' -) , -) +6 / 6).63 56+9*+ / 6)&

3&@ FIE#D PERFORMANCE VERIFICATION

A& #6,<,26: P+633'+.C6 4,3.-2 (* / ,E./ ' / *56+,(.-2 3(,(.4 5+633'+6 \$'5 (* M/"FK 7&2& , -) / 6,3'+6 06,<,26& 19 06,<,26 6E466)3 1R *9)63.2- ,.+90*7: 36,0 06,<,26 5*.- (3 7.(1 , 56+ / , -6-(3*0'(*-& R656,((63& 19 (16 AHU 3(.00) *63 - *(5,33: 4*-(,4((16 / , - '9,4('+6+ (* 36,0 ' -.&

B& S'>/.(, 9.60) (63(+65*(7.(1 (63(-.2) , (, +64*+)6)& 1-40')6)634+.5(*- *9 4*++64(.86 , 4(*-3 (, <6-&

3&7 C#EANIN !

A& C06 , - ' -.(.-(6+. *+ 5+. *+ (* *56+,(.-2& R6 / *86 (*03:)6>+.3:)' 3(, -) .+(&

B& C06 , - 6E(6+. *+ 5+. *+ (* (+ , -396+ (* *7-6+&

3&F DOCUMENTATION

A& P+*8.)6 1-3(,00,(.*- 1-3(+ '4(*- M, - ' ,0: J S(+('5 4164<0.3(.- (16 3' 550; 9 , - 364(*- *9 6,41 ' -.&

B& P+*8.)6 3.E 4*5.63 *9 S5 ,+6 P ,+(3 M, - ' ,0 9*+ *7-6+P3 5+*H64(3;3(6 / / , - ' ,0&

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