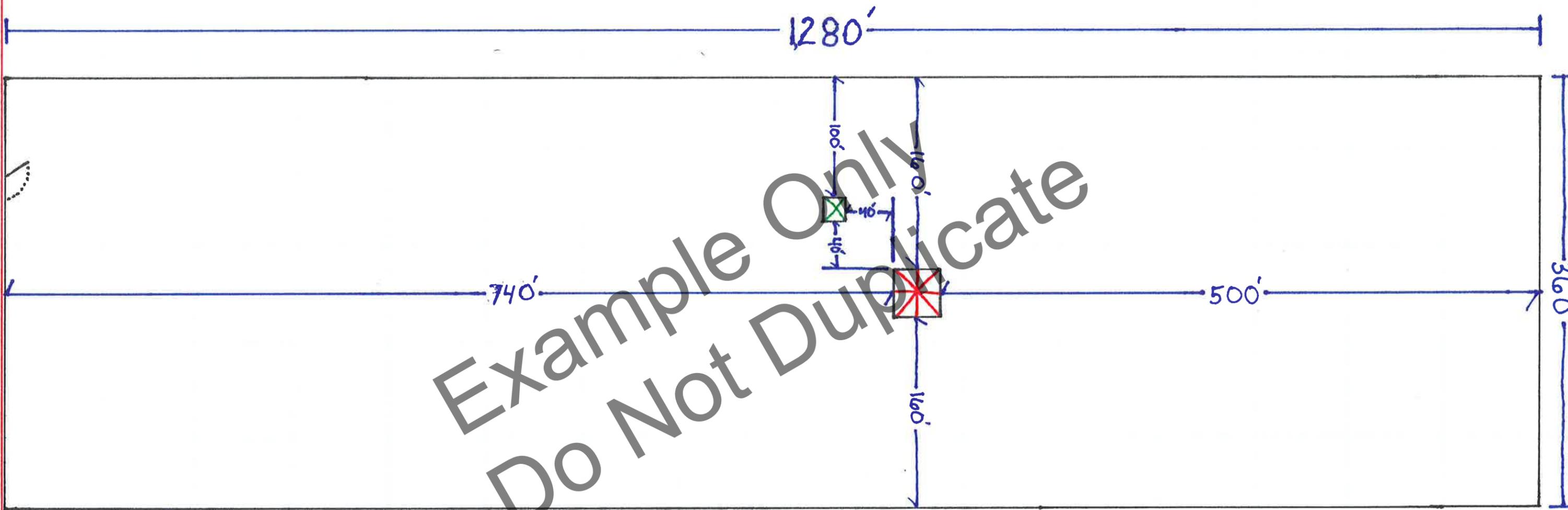


GENERAL NOTES

1. THIS PROJECT SHALL COMPLY WITH THE 2010 CALIFORNIA RESIDENTIAL CODE WHICH ADOPTS THE 2009 IRC, 2009 UMC, 2009 UPC AND THE 2008 NEC SECTION R106.2.
2. MASTER BATHROOM SCOPE OF WORK: DIVIDE EXISTING LAUNDRY ROOM IN HALF BY BUILDING A WALL FROM SIDE TO SIDE AND FROM FLOOR TO CEILING. REMOVE EXISTING EXTERIOR DOOR AND MAKE A PASS THROUGH TO WHERE THE EXISTING PATIO WILL BECOME THE WATERCLOSET AND WE WILL ENCLOSE THE PATIO AREA BY BUILDING (3) WALLS. ONE WALL WILL HAVE AN OPERATIONAL WINDOW IN IT TO ALLOW FOR VENTILATION. ALL NEW PLUMBING WASTE LINES WILL BE UNDER A NEW 6" CONCRETE SLAB AND WILL TIE INTO THE EXISTING WASTE LINES TO THE NORTH OF THE BATHROOM. INTERIOR WALLS WILL BE DRYWALL AND THE EXTERIOR WILL BE STUCCO TO MATCH EXISTING. TOTAL SQ. FOOTAGE OF MASTER BATHROOM IS 80 SQ. FOOT. ONLY 36 SQ. FT. WILL BE NEW INTERIOR. NO NEW ROOF WILL BE BUILT. WE WILL ALSO BE SUBCONTRACTING L.T. AIR CORPORATION TO INSTALL A NEW AND COMPLETE FAU/AC SYSTEM (SEE HVAC DETAILS + NOTES SHEETS FOR MORE INFO ON SYSTEM) THE SYSTEM WILL BE PLACED ON A CAT WALK IN THE ATTIC PER UBC STANDARDS AND THE CONDENSER WILL BE PLACED ON THE EXTERIOR OF THE DWELLING PER UBC STANDARDS. (3 SEER COND.)
3. ALL ENERGY WORKSHEETS AND ENERGY RELATED ITEMS ARE TO COMPLY WITH THE RESIDENTIAL COMPLIANCE MANUAL FOR CALIFORNIA 2008 ENERGY EFFICIENCY STANDARDS.
4. ALL BATHROOM AND LAUNDRY ROOM FIXTURES MUST BE HIGH EFFICIENCY STYLE, OR CONTROLLED BY A MANUALLY-ON OCCUPANCY SENSOR TO COMPLY WITH THE RESIDENTIAL ENERGY LIGHTING REQUIREMENTS
5. ALL ROOMS OTHER THAN BATHROOMS AND THE LAUNDRY ROOM REQUIRE ANY INSTALLED FIXTURES TO BE HIGH EFFICIENCY OR BE CONTROLLED BY A MANUALLY-ON OCCUPANCY SENSOR OR DIMMER. (CLOSETS UNDER 70 SQ. FT. ARE EXEMPT.)
6. CEC ARTICLE 210 + 406: TAMPER RESISTANT RECEPTICLES FOR ALL LOCATIONS DESCRIBED IN 210.52 MUST BE INSTALLED ARC FAULT PROTECTION FOR ALL OUTLETS (NOT JUST RECEPTICLES) LOCATED IN ROOMS DESCRIBED IN NEC 210.12(B); FAMILY, LIVING, BEDROOMS, DINING, HALLS, ETC. ARE TO BE INSTALLED
7. CARBON MONOXIDE ALARMS ARE TO BE PROVIDED OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
8. SMOKE ALARMS ARE TO BE INSTALLED IN ALL EXISTING BEDROOMS AND HALLWAYS LEADING TO BEDROOMS.
9. ALL EPOXIED OR RETRO-FIT HARDWARE IS TO BE INSTALLED UNDER THE SUPERVISION OF A SPECIAL DEPUTY INSPECTOR.
10. NO ROOF FRAMING IS NECESSARY. WE ARE NOT ADDING ANY ROOF. WE ARE ENCLOSING A PORTION OF THE EXISTING ROOF UNDER THE BACK PORCH. IF ANY NEW ROOFING MATERIALS SHOULD BE NEEDED WE WILL PROVIDE THE CITY OF MENIFEE WITH THE MANUFACTURER'S NAME AND ICC APPROVAL NUMBER OR EQUIVILANT UPON DEMAND.
11. NO WALLS ARE BEING REMOVED OR RELOCATED
12. A MINIMUM OF 30" DEEP OF UNOBSTRUCTED WORKING SPACE IS REQUIRED IN FRONT OF THE FURNACE.
13. ADEQUATE COMBUSTION AIR WILL BE PROVIDED TO THE FURNACE
14. THE PASSAGE WAY TO THE MECHANICAL EQUIPMENT IN THE ATTIC SHALL BE UNOBSTRUCTED AND HAVE CONTINUOUS SOLID FLOORING NOT LESS THAN 24" WIDE AND NO LONGER THAN 20' LONG THROUGH THE ATTIC
15. A PERMANENT RECEPTICLE OUTLET AND A LIGHT CONTROLLED BY A SWITCH IS TO BE LOCATED AT THE FRONT OF THE FURNACE

SITE PLAN

1/4" = 20'



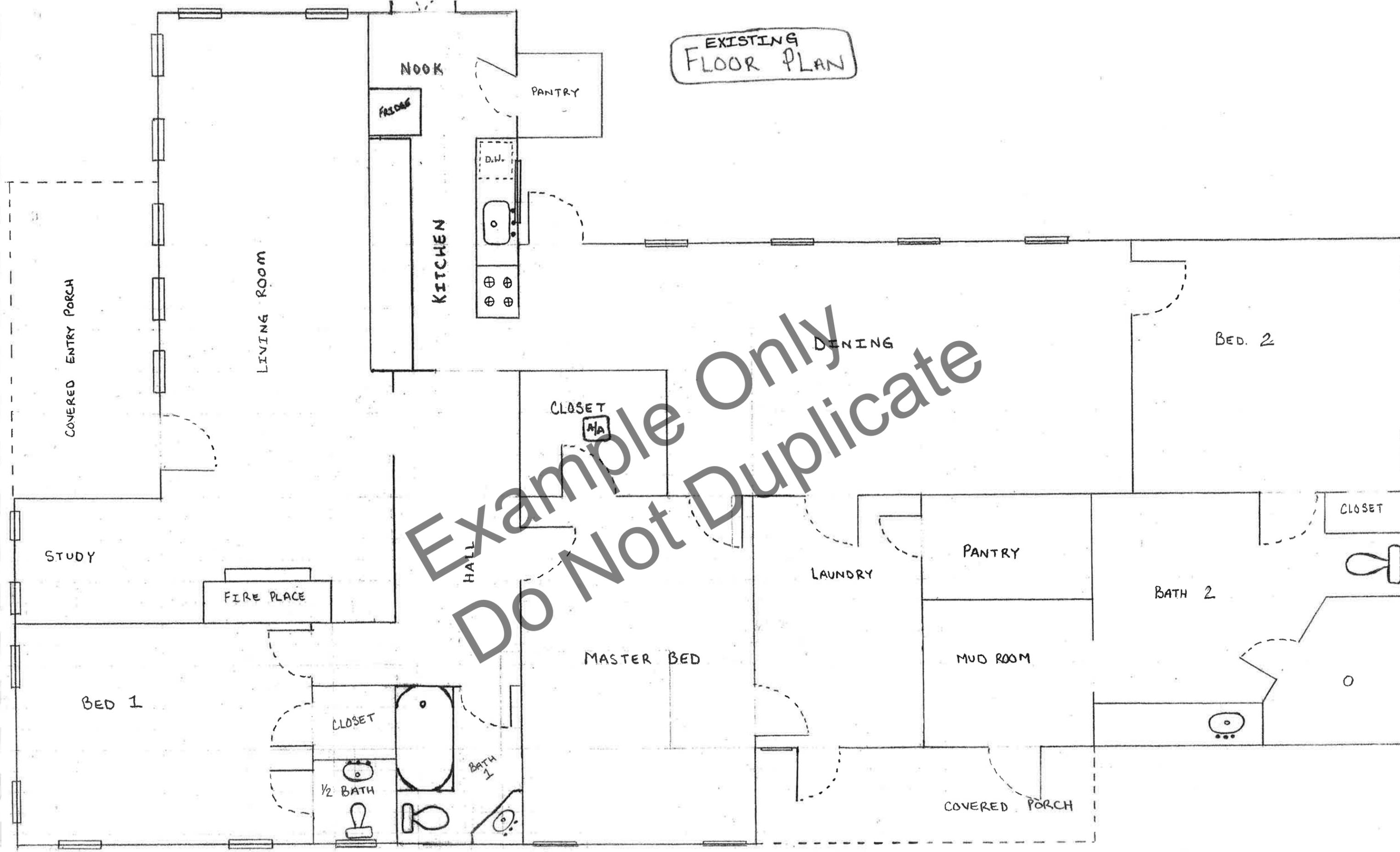
MANEX INT.

Example Only
Do Not Duplicate



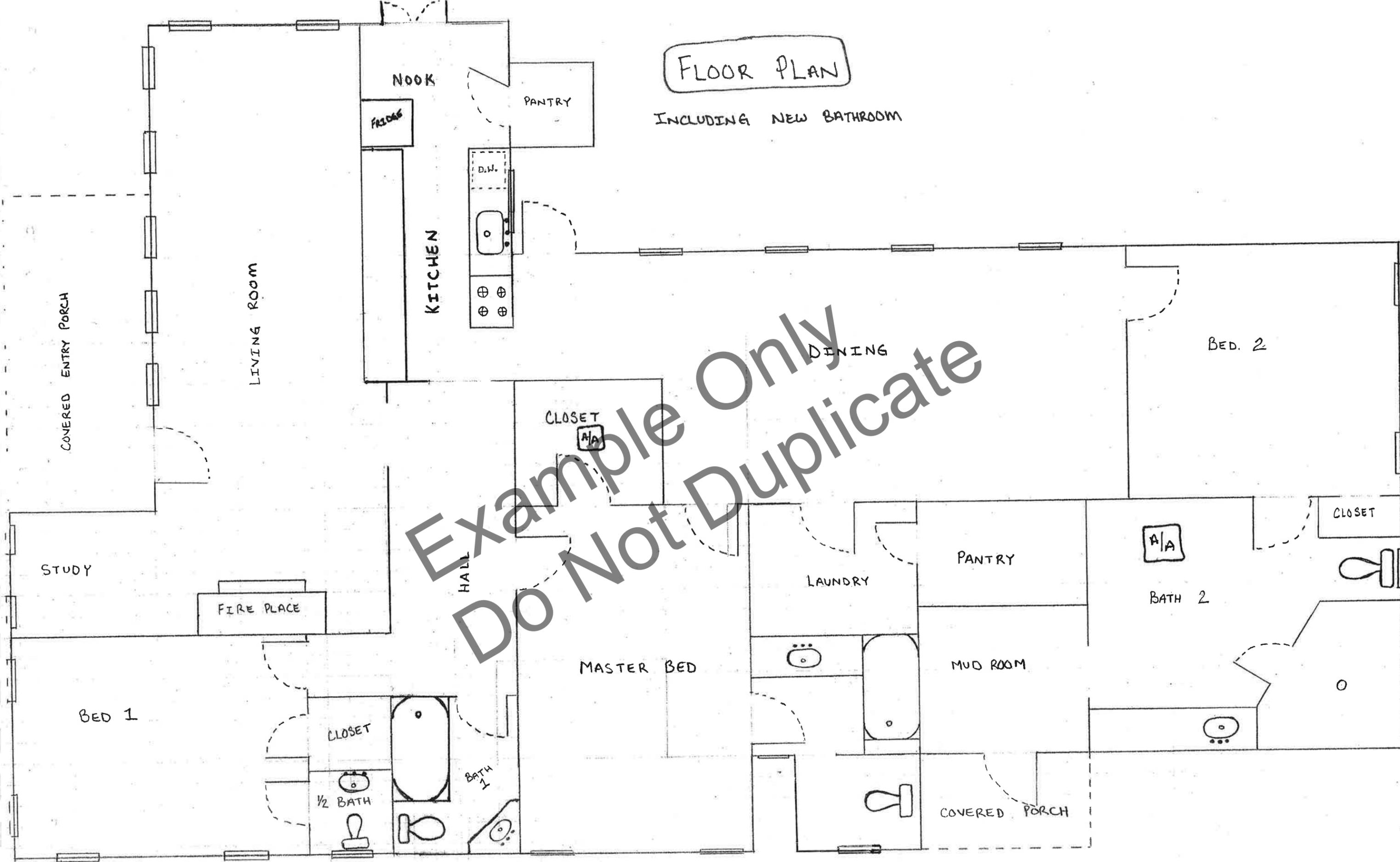
- STREET LINE
- DIMENSIONS
- PROPERTY LINE
- ENTRY GATE
- SHED
- HOUSE

EXISTING FLOOR PLAN



FLOOR PLAN

INCLUDING NEW BATHROOM



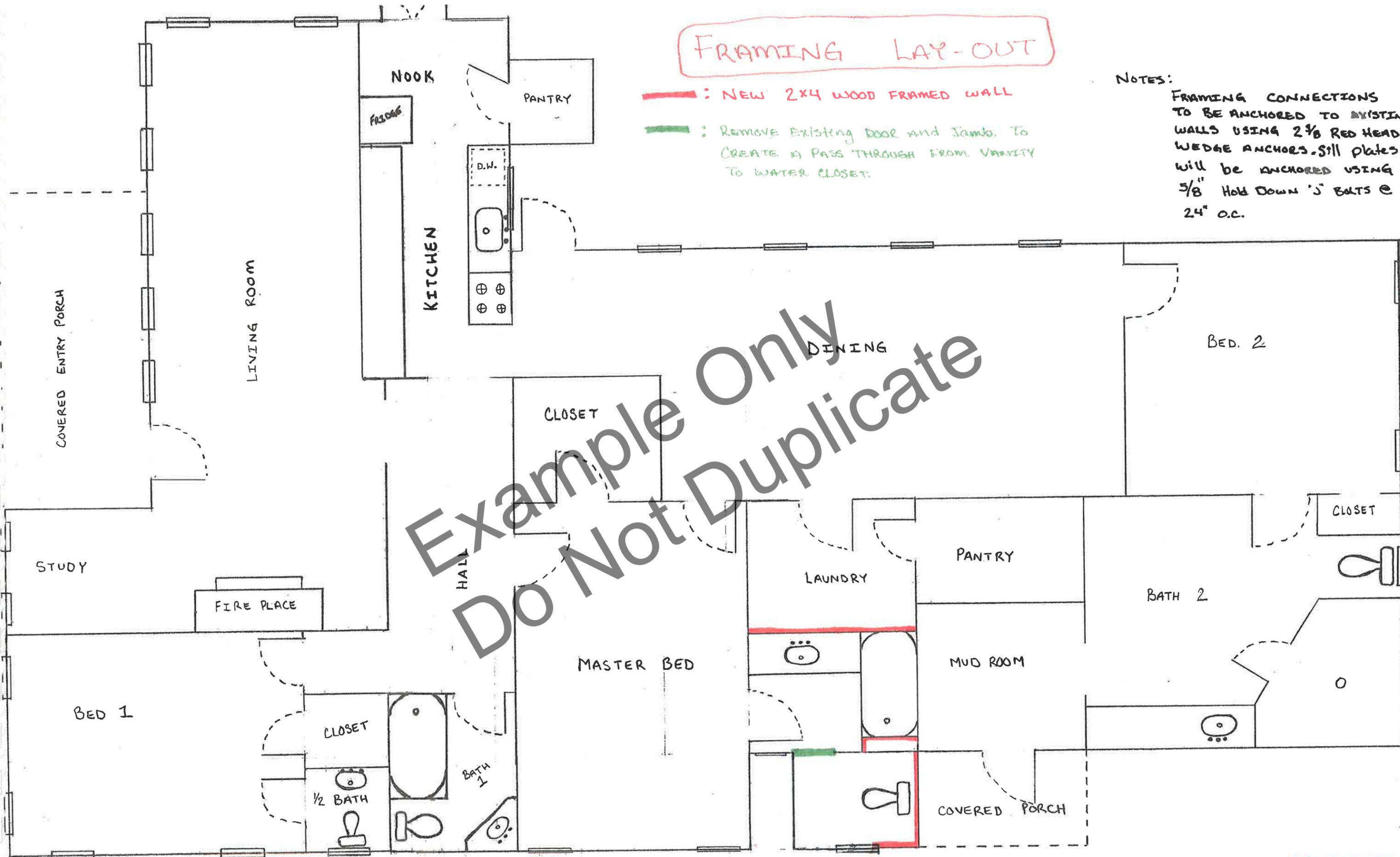
FRAMING LAY-OUT

— : NEW 2x4 WOOD FRAMED WALL

— : REMOVE EXISTING DOOR AND JAMB. TO CREATE A PASS THROUGH FROM VANITY TO WATER CLOSET.

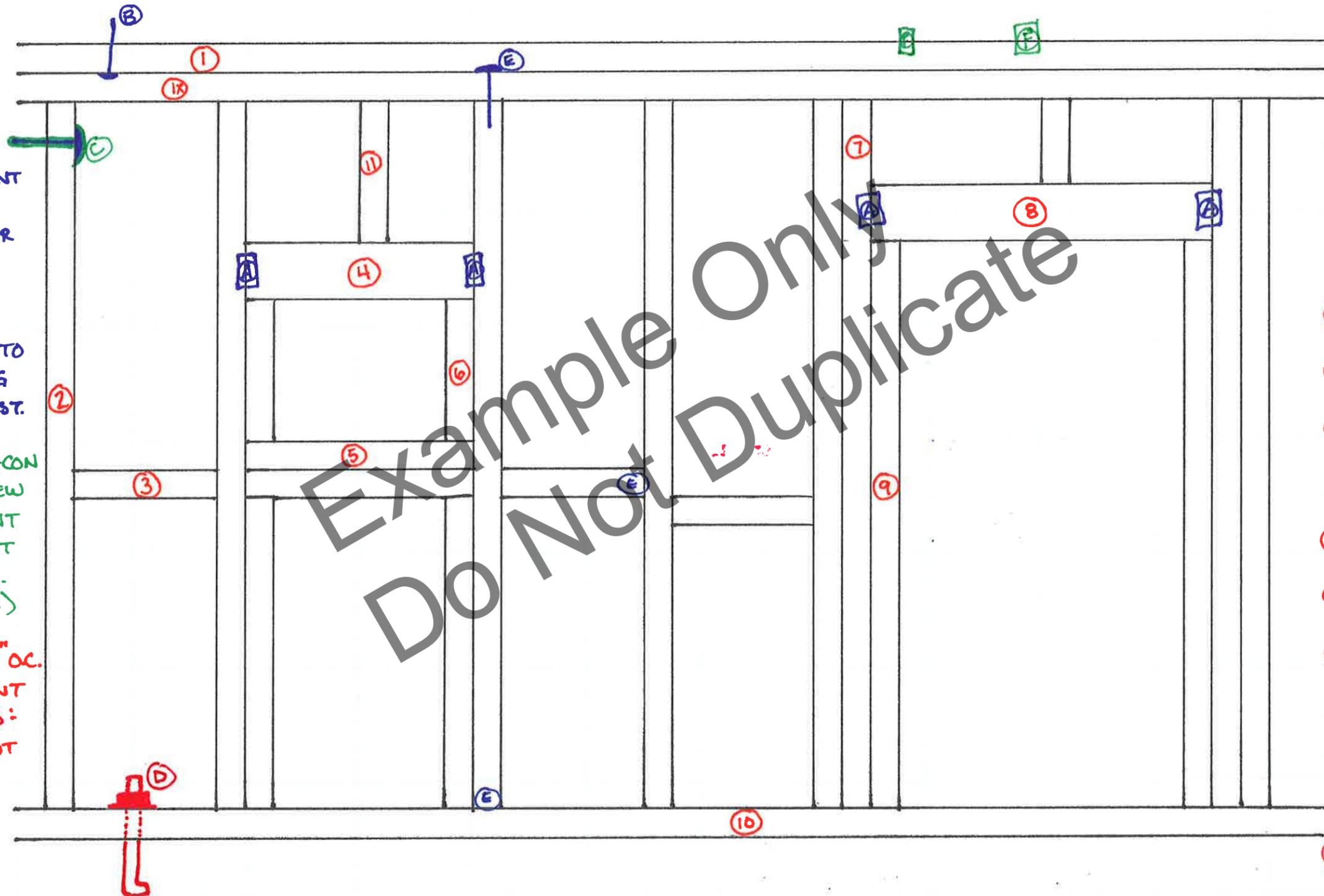
NOTES:

FRAMING CONNECTIONS TO BE ANCHORED TO EXISTING WALLS USING 2 7/8 RED HEAD WEDGE ANCHORS. SILL PLATES WILL BE ANCHORED USING 5/8" HOLD DOWN 'J' BOLTS @ 24" O.C.



TYPICAL WALL FRAMING DETAIL

(NOT TO SCALE)



A LPT-4 OR EQUIVALENT FROM HEADER TO KING STUD (4) PER HEADER

B 16d NAIL FROM UPPER TOP PLATE TO EXISTING CEILING JOIST (2) PER JOIST.

C 3" CONCRETE TAP-CON ANCHOR FROM NEW STUD TO ADJACENT EXISTING CEMENT WALL @ 12" O.C. STAGGERED (TYP.)

D 5/8" H.D. @ 24" O.C. MIN. EMBEDDMENT INTO NEW SLAB: 3" w/ WASHER + NUT

E 16d NAIL FOR TYP. FRAMING CONNECTIONS

F LTP4 @ TOP PLATE TO EXISTING TOP PLATE OR HEADER @ 12" O.C.

1 TOP PLATE SECURED TO EXISTING CEILING JOIST

1X DOUBLE TOP PLATE

2 TYP. WALL STUD 2X4

3 FIRE BLOCK (TYP.)

4 4X4 WINDOW HEADER

5 DOUBLE WINDOW SILL

6 WINDOW CRIPPLE

7 2X4 KING STUD (TYP.)

8 4X4 DOOR HEADER

9 TRIMMER STUD (TYP.)

10 PRESSURE TREATED 2X4 BOTTOM SILL PLATE

11 HEADER CRIPPLE (TYP.)

FOUNDATION PLAN

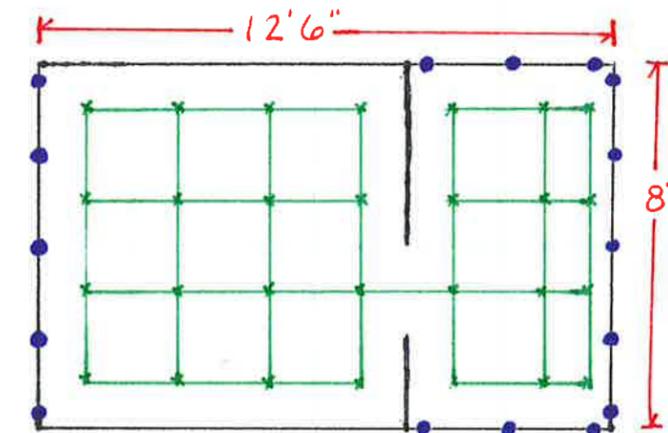
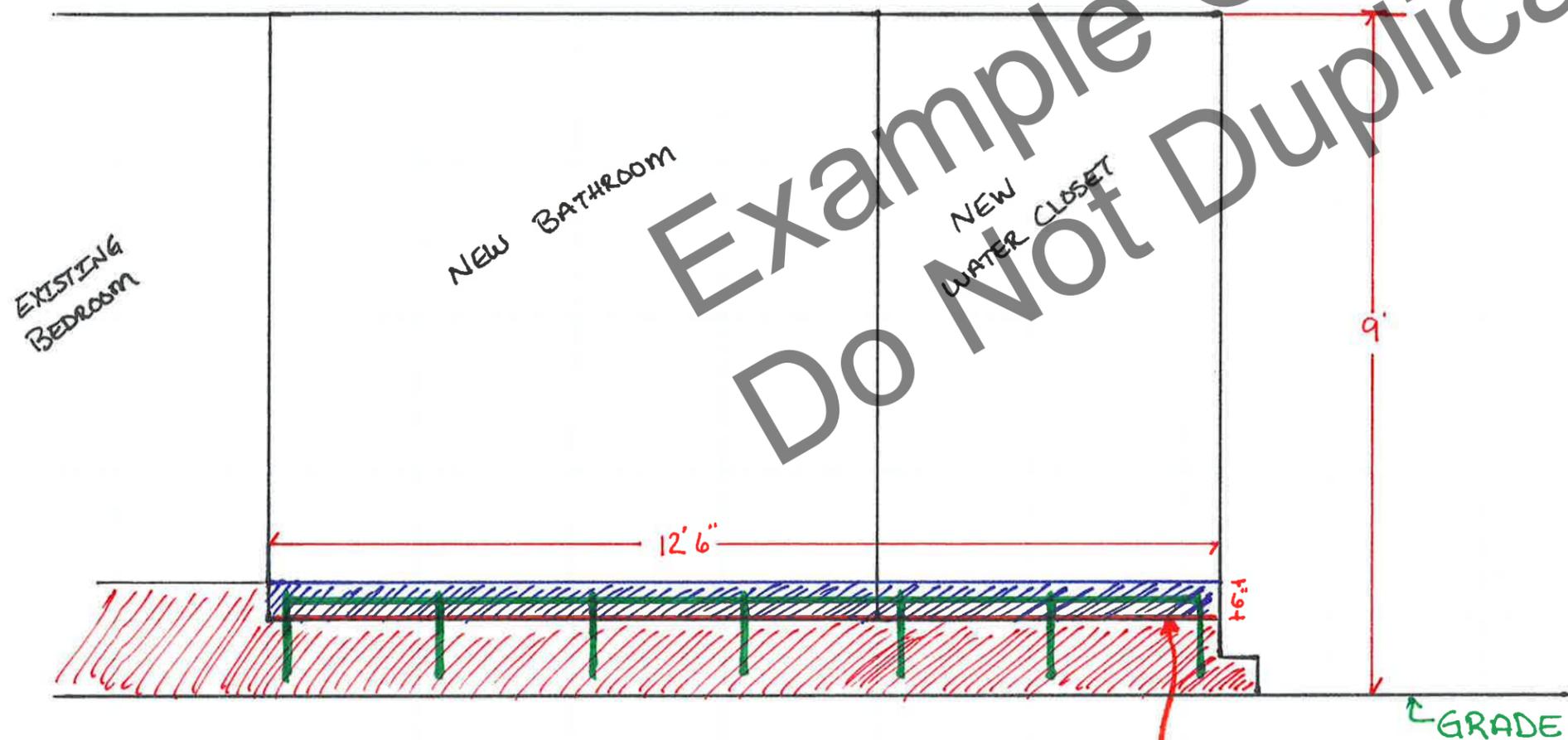
(ELEVATION)

SCALE: 1/2" = 1'

 EXISTING FOUNDATION

 NEW FOUNDATION

 #4 REBAR @ 24" O.C.
12" LONG. MIN. EMBEDMENT
OF 8" INTO EXISTING
SLAB. EPOXY TO BE
VARIFIED BY A SPECIAL
DEPUTY INSPECTOR.



TOP VIEW
SCALE: 1/4" = 1'

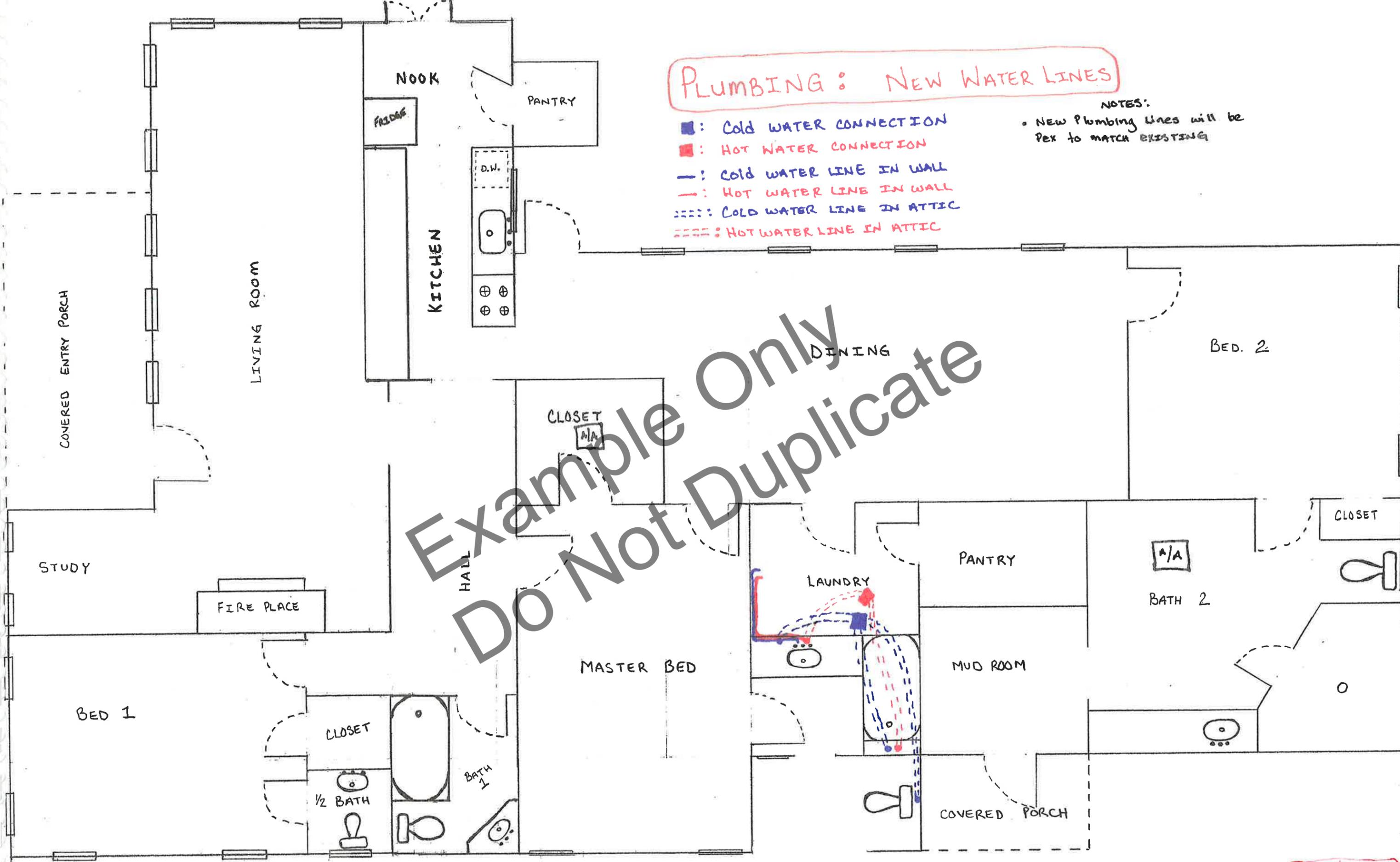
• 5/8 ANCHOR BOLT PAB5H
WITH 1 1/2" X 1 1/2" X 3/8 THICK
PLATE WASHER AND NUT.

6 mil. VISQUEEN BETWEEN EXISTING SLAB + NEW SLAB
(NO SAND IS REQUIRED IN THIS APPLICATION)

PLUMBING: NEW WATER LINES

- : COLD WATER CONNECTION
- : HOT WATER CONNECTION
- : COLD WATER LINE IN WALL
- : HOT WATER LINE IN WALL
- : COLD WATER LINE IN ATTIC
- : HOT WATER LINE IN ATTIC

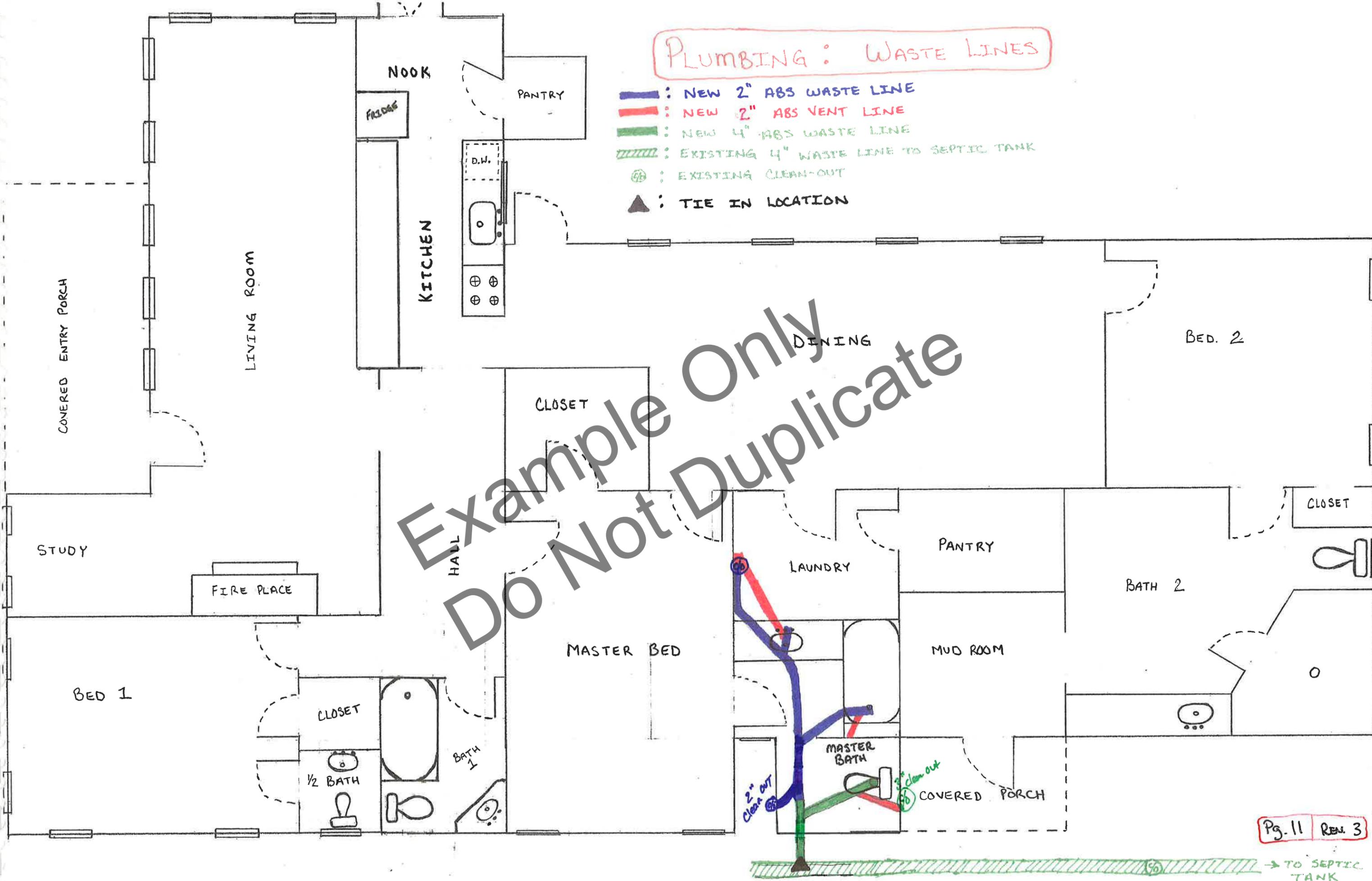
NOTES:
 • New Plumbing Lines will be PEX to match existing



Example Only
Do Not Duplicate

PLUMBING : WASTE LINES

- : NEW 2" ABS WASTE LINE
- : NEW 2" ABS VENT LINE
- : NEW 4" ABS WASTE LINE
- ▨ : EXISTING 4" WASTE LINE TO SEPTIC TANK
- ⊕ : EXISTING CLEAN-OUT
- ▲ : TIE IN LOCATION

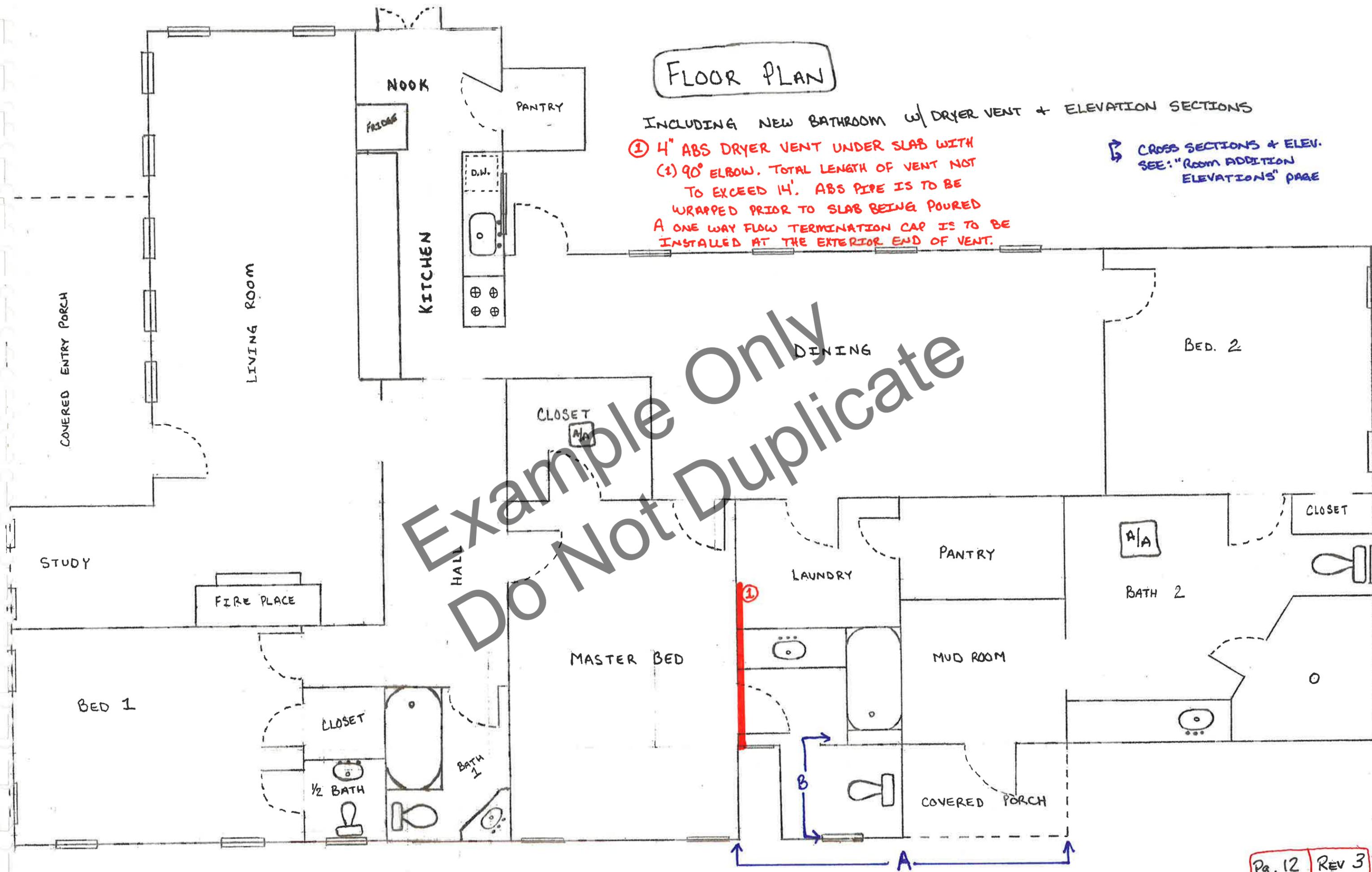


FLOOR PLAN

INCLUDING NEW BATHROOM w/ DRYER VENT + ELEVATION SECTIONS

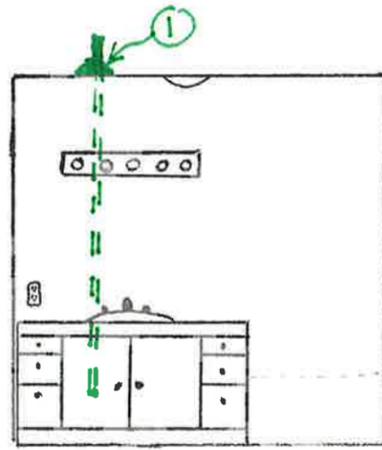
① 4" ABS DRYER VENT UNDER SLAB WITH
(1) 90° ELBOW. TOTAL LENGTH OF VENT NOT
TO EXCEED 14'. ABS PIPE IS TO BE
WRAPPED PRIOR TO SLAB BEING POURED
A ONE WAY FLOW TERMINATION CAP IS TO BE
INSTALLED AT THE EXTERIOR END OF VENT.

↪ CROSS SECTIONS + ELEV.
SEE: "ROOM ADDITION
ELEVATIONS" PAGE



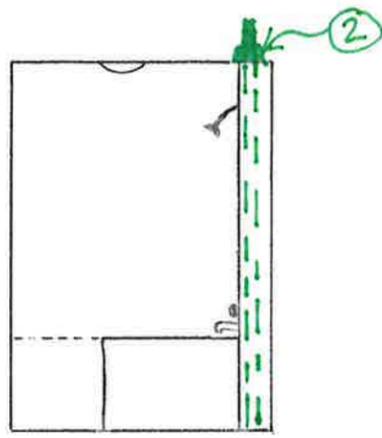
Example Only
Do Not Duplicate

NEW MASTER BATHROOM ELEVATIONS
WITH VENT PIPES



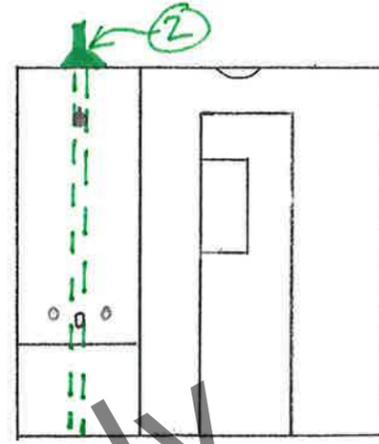
PULLMAN

① LANY VENT PIPE

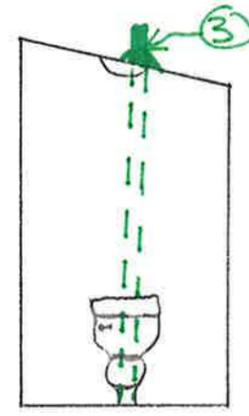


TUB/SHOWER

② SHOWER VENT PIPE



PASS THROUGH



TOILET

③ TOILET VENT PIPE

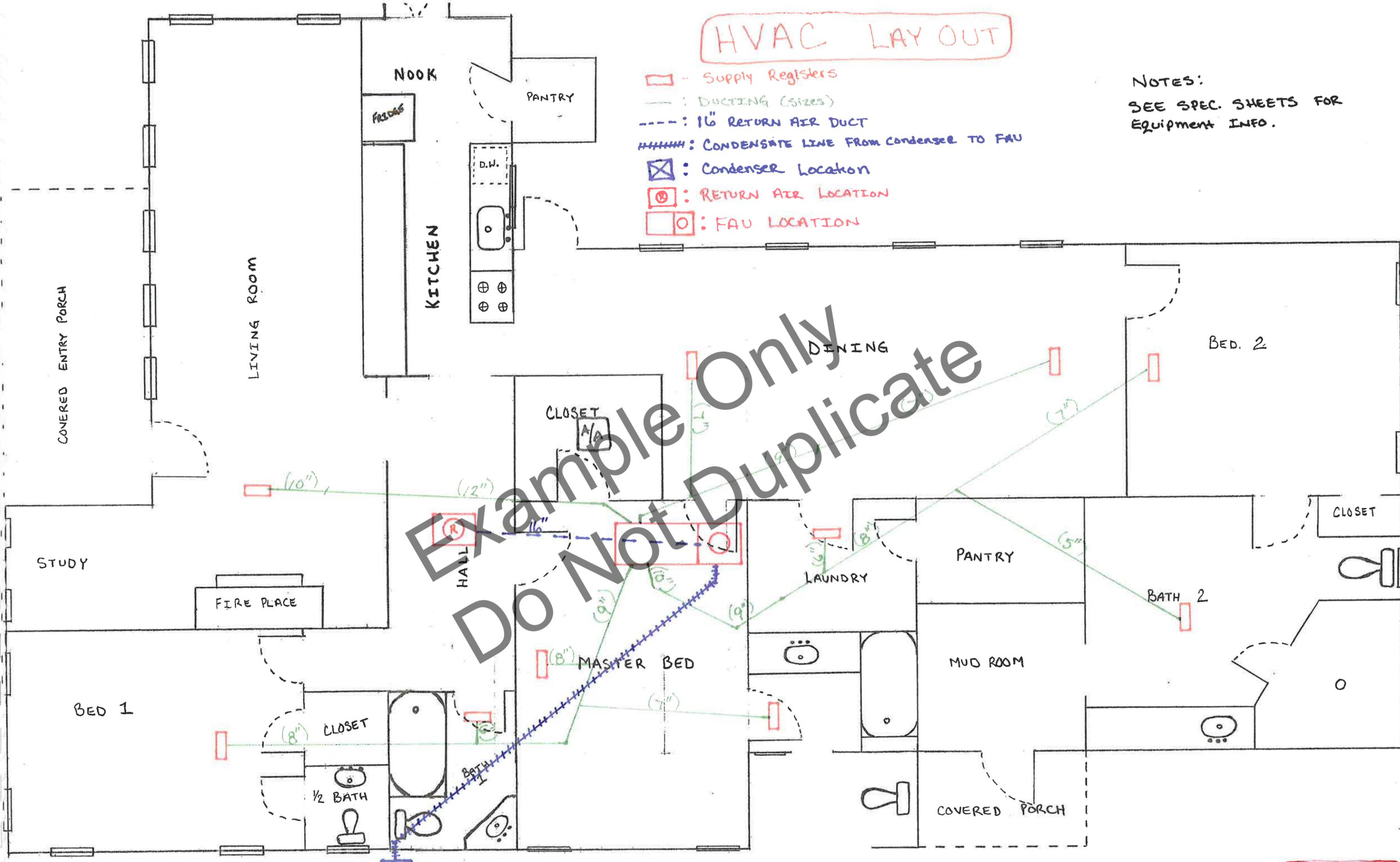
Example Only
Do Not Duplicate

ALL VENT PIPES ARE TO BE ABS AND 2"
ALL ROOF PENNETRATIONS ARE TO BE FLASHED
AND HAVE ROOF JACKS.

HVAC LAY OUT

- ☐ - Supply Registers
- : DUCTING (SIZES)
- : 16" RETURN AIR DUCT
- ##### : CONDENSATE LINE FROM CONDENSER TO FAU
- ⊗ : CONDENSER LOCATION
- Ⓜ : RETURN AIR LOCATION
- Ⓞ : FAU LOCATION

NOTES:
SEE SPEC. SHEETS FOR
EQUIPMENT INFO.



Example Only
Do Not Duplicate

ATTIC
ACCESS

FAU DETAIL

PLATFORM / CAT WALK
w/ Light + Recepticle

SCALE: 1" = 1'

EXISTING ATTIC
LIGHT + SWITCH

NEW LIGHT
IN FRONT
OF FAU

OUTLET
FOR FAU

FAU

EXHAUST VENT
THROUGH ROOF
FOR FAU

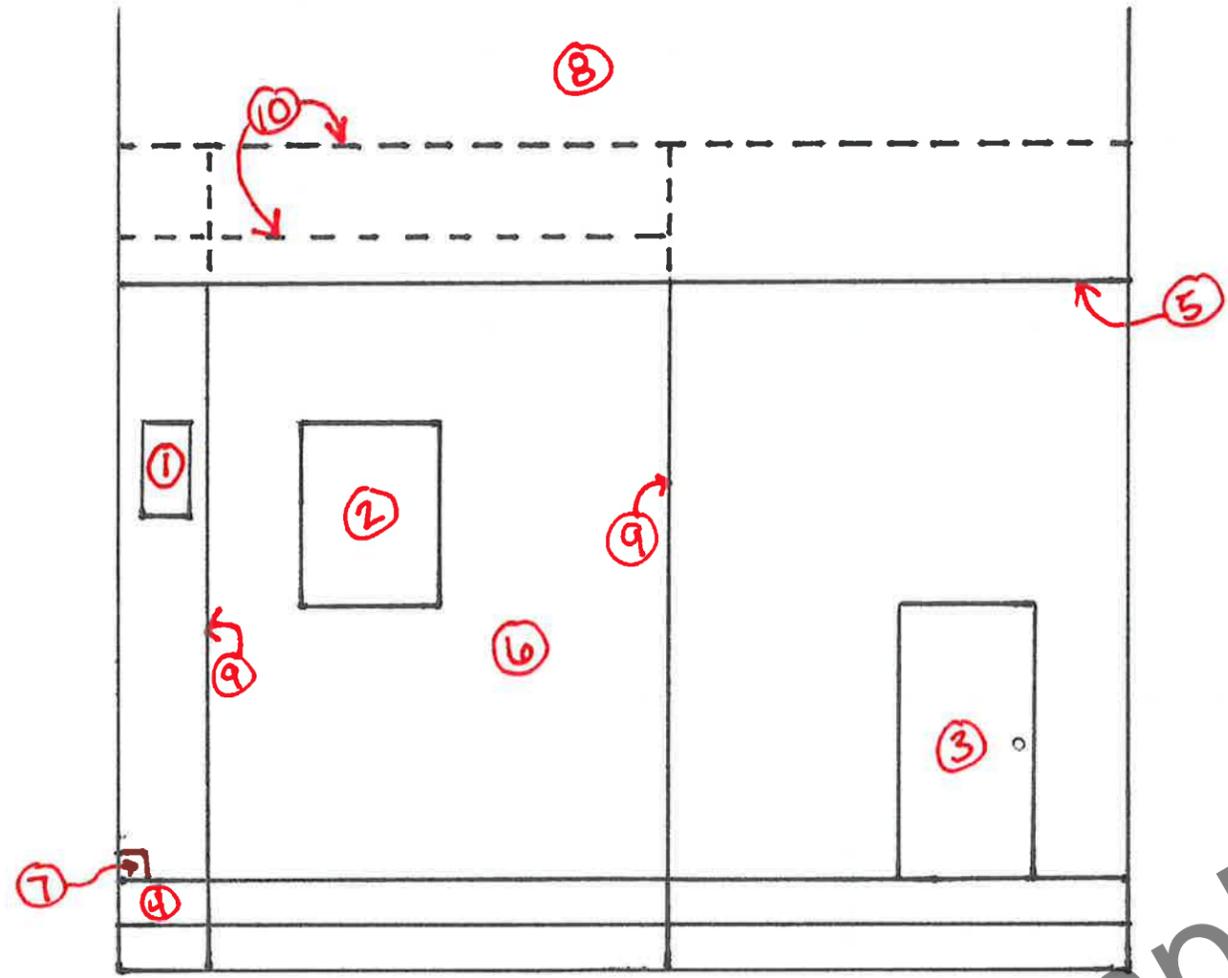
NEW FAU
CAT WALK
AND PLATFORM
7' x 12'6"

Example Only
Do Not Duplicate

ROOM ADDITION ELEVATIONS.

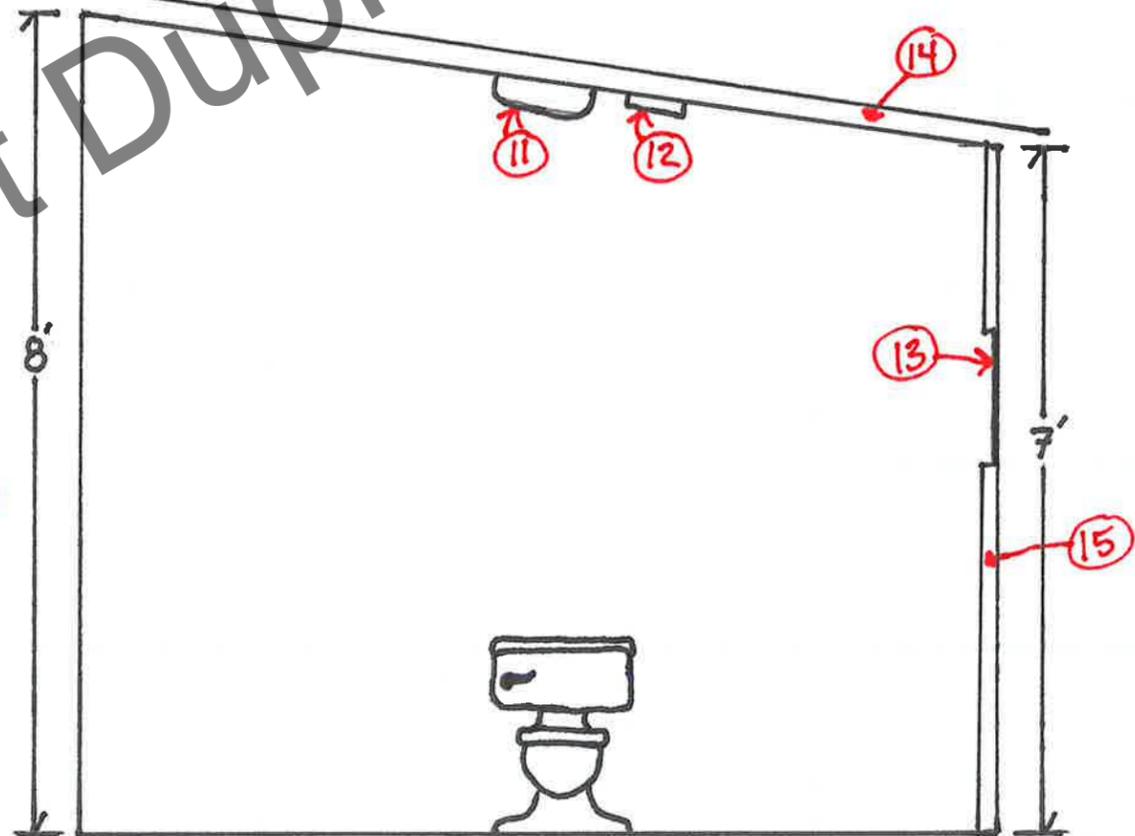
"NOT TO SCALE"

- ① ELECTRICAL SUB PANEL
- ② NEW WINDOW IN BATHROOM (2020 X0) LOW E VINYL FRAME
- ③ EXISTING DOOR TO MUD ROOM
- ④ EXISTING CONCRETE STEPS
- ⑤ ROOF/EAVE LINE (EXISTING TO REMAIN)
- ⑥ STUCCO EXTERIOR FINISH
- ⑦ DRYER VENT TERMINATION
- ⑧ EXISTING ROOF SHINGLES (ASPHALT)
- ⑨ NEW FRAMED WALLS
- ⑩ INTERIOR CEILING LINE



EXTERIOR ELEV. (A)

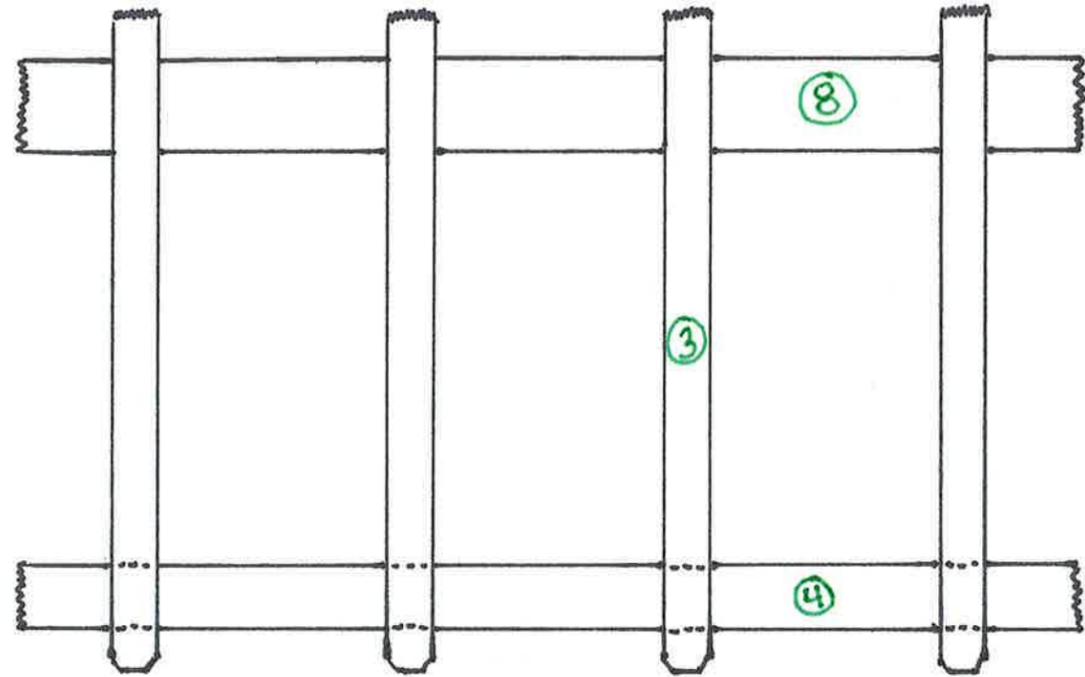
- ⑪ LIGHT FIXTURE
- ⑫ EXHAUST FAN
- ⑬ NEW WINDOW (LOW E)
- ⑭ R-13 INSULATION IN ALL NEW WALLS (EXT.)
- ⑮ R-19 INSULATION IN CEILING (NEW)



INTERIOR ELEV. (B)

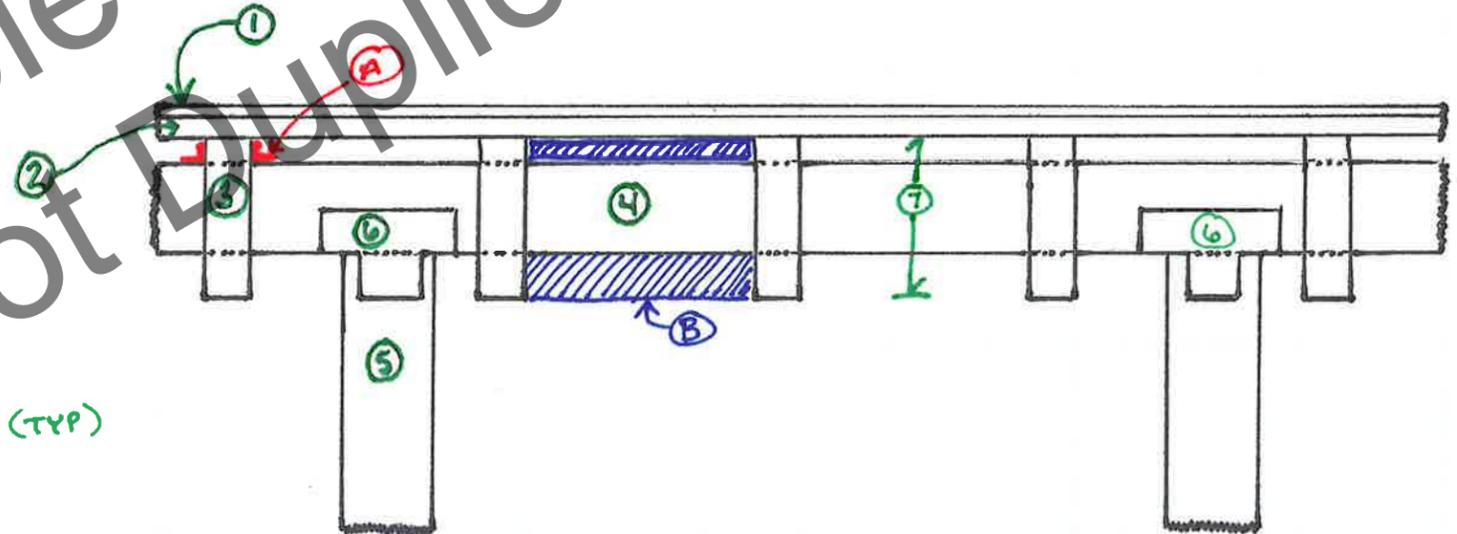
EXISTING ROOF PLAN

(NOT TO SCALE)



TOP VIEW

- ① EXISTING ASPHALT ROOF SHINGLES
- ② EXISTING ROOF SHEATHING
- ③ EXISTING 2x6 CEILING JOIST @ 16" O.C. (TYP)
- ④ EXISTING 4x6 HEADER



FRONT VIEW

- ⑤ EXISTING 4x4 POST @ 8' O.C.
- ⑥ EXISTING SHEAR TRANSFER SADDLE FROM HEADER TO POST (TYP)
- ⑦ ALLOWABLE SPACE FOR R-19 INSULATION
- ⑧ EXISTING CONCRETE WALL WITH WOOD TOP CAP

Ⓐ A35 @ EACH JOIST TO TOP PLATE OR HEADER

Ⓑ NEW BLOCKING INSTALLED WITH EDGE NAILING @ 6" O.C.

DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

REPORT HOLDER:

ITW RED HEAD
 2171 EXECUTIVE DRIVE, SUITE 100
 ADDISON, ILLINOIS 60101
 (800) 899-7890
 www.itw-redhead.com
 techsupport@itw-redhead.com

ADDITIONAL LISTEES:

ITW BRANDS
 955 NATIONAL PARKWAY, SUITE 95500
 SCHAUMBURG, ILLINOIS 60173
 (877) 489-2726
 www.itwbrands.com

ITW BUILDDEX
 1349 WEST BRYN MAWR AVENUE
 ITASCA, ILLINOIS 60143
 (800) BUILDDEX
 www.itwbuilddex.com

EVALUATION SUBJECT:

ITW RED HEAD CARBON STEEL TRUBOLT+ WEDGE ANCHORS, STAINLESS STEEL TRUBOLT+ WEDGE ANCHORS AND CARBON STEEL SAMMYS TRUBOLT+ WEDGE ANCHORS FOR CRACKED AND UNCRACKED CONCRETE

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2009 International Building Code® (2009 IBC)
- 2009 International Residential Code® (2009 IRC)
- 2006 International Building Code® (2006 IBC)
- 2006 International Residential Code® (2006 IRC)
- 2003 International Building Code® (2003 IBC)
- 2003 International Residential Code® (2003 IRC)
- 1997 Uniform Building Code™ (UBC)

Property evaluated:

Structural

2.0 USES

The carbon steel and stainless steel Trubolt+ Wedge Anchors and 3/8-inch-diameter (9.5 mm) carbon steel Sammys Trubolt+ Wedge Anchor are used to resist static, wind, and seismic tension and shear loads in cracked and uncracked normal-weight and sand-lightweight concrete having a specified compressive strength, f'_c , ranging from 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

The carbon steel Trubolt+ Wedge Anchors with diameters of 3/8 inch (9.5 mm), 1/2 inch (12.7 mm) and 5/8-inch (15.9 mm) and the carbon steel Sammys 3/8-inch-diameter (9.5 mm) are used to resist static, wind, and seismic tension and shear loads in cracked and uncracked normal-weight or sand-lightweight concrete over steel deck having a minimum specified compressive strength, f'_c , of 3,000 psi (20.7 MPa).

The Trubolt+ Wedge anchors comply with requirements for anchors installed in hardened concrete as described in Section 1912 of the 2009 and 2006 IBC and Section 1913 of the 2003 IBC. The anchors are alternatives to cast-in-place anchors described in Section 1911 of the 2009 and 2006 IBC, Section 1912 of the 2003 IBC and Sections 1923.1 and 1923.2 of the UBC. The anchors may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 RED HEAD Carbon Steel Trubolt+ Wedge Anchor:

The RED HEAD Trubolt+ Wedge Anchor is a torque-controlled, wedge-type mechanical expansion anchor, available in 3/8-inch (9.5 mm), 1/2-inch (12.7 mm), 5/8-inch (15.9 mm) and 3/4-inch (19.1 mm) diameters. The Trubolt+ Wedge Anchor consists of a high-strength threaded anchor body, expansion clip, hex nut and washer. The anchor body is cold-formed from low carbon steel materials conforming to AISI 1015 or AISI 1018 with mechanical properties (yield and ultimate strengths) as described in Tables 3 and 4 of this report. The zinc plating on the anchor body complies with ASTM B 633 SC1, Type III, with a minimum 0.0002-inch (5 µm) thickness. The expansion clip is fabricated from low carbon steel materials conforming to AISI 1020. The standard hexagonal steel nut conforms to ANSI B18.2.2-65 and the washer conforms to ANSI/ASME B18.22.1 1965 (R1981). The Trubolt+ Wedge anchor body consists of a threaded section throughout the majority of its length and a wedge section at the far end. The expansion clip is formed around the anchor, just above the wedge. The expansion clip consists of a split cylindrical ring with undercutting grooves at the bottom

end. During torquing of the anchor, the grooves in the expansion clip are designed to cut into the walls of the concrete hole as the wedge portion of the stud is forced upward against the interior of the clip (U.S. patent nos. 7,744,320 and 7,811,037). The Trubolt+ Wedge anchor is illustrated in Figure 1 of this report.

3.2 RED HEAD Stainless Steel Trubolt+ Wedge Anchor:

The RED HEAD Trubolt+ Wedge Anchor is a torque-controlled, wedge-type mechanical expansion anchor, available in 1/2-inch (12.7 mm) and 5/8-inch (15.9 mm) diameters. The Trubolt+ Wedge Anchor consists of a high-strength threaded anchor body, expansion clip, hex nut and washer. The anchor body is cold-formed from AISI Type 316 stainless steel materials with mechanical properties (yield and ultimate strengths) as described in Tables 5 and 6 of this report. The expansion clip is fabricated from Type 316 stainless steel materials. The Type 316 stainless steel hexagonal steel nut conforms to ANSI B18.2.2-65 and the AISI Type 316 stainless steel washer conforms to ANSI/ASME B18.22.1 1965 (R1981). The Trubolt+ Wedge anchor body consists of a threaded section throughout the majority of its length and a wedge section at the far end. The expansion clip is formed around the anchor, just above the wedge. The expansion clip consists of a split cylindrical ring with undercutting grooves at the bottom end. During torquing of the anchor, the grooves in the expansion clip are designed to cut into the walls of the concrete hole as the wedge portion of the stud is forced upward against the interior of the clip. The Trubolt+ Wedge anchor is illustrated in Figure 1 of this report.

3.3 Sammys Trubolt+ Wedge Anchor:

The Sammys Trubolt+ Wedge Anchor is a torque-controlled, wedge-type mechanical expansion anchor, available in 3/8-inch (9.5 mm) diameter. The Sammys Trubolt+ Wedge Anchor consists of a high-strength threaded anchor body, expansion clip, coupling nut and washer. The anchor body is cold-formed from low carbon steel materials with the mechanical properties (yield and ultimate strengths) as described in Tables 3 and 4 of this report. The zinc plating on the anchor body complies with ASTM B633 SC1, Type III, with a minimum 0.0002 inch (5 µm) thickness. The expansion clip is fabricated from low carbon steel materials. The coupling nut consists of Grade 2 steel with 3/8"-16 threads throughout the length of the nut. The washer complies with ANSI/ASME B18.22.1 1965 (R1981). The Sammys Trubolt+ Wedge anchor body consists of a threaded section throughout the majority of its length and a wedge section at the far end. The expansion clip is formed around the anchor, just above the wedge. The expansion clip consists of a split cylindrical ring with undercutting grooves at the bottom end. During torquing of the anchor (using coupling nut), the grooves in the expansion clip are designed to cut into the walls of the concrete hole as the wedge portion of the anchor body is forced upward against the interior of the clip (U.S. patent nos. 7,744,320 and 7,811,037). The Sammys Trubolt+ Wedge anchor is illustrated in Figure 2 of this report.

3.4 Concrete:

Normal-weight and sand-lightweight concrete must comply with Sections 1903 and 1905 of the IBC and UBC, as applicable.

3.5 Steel Deck Panels:

Steel deck panels must comply with ASTM A 653, SS Grade 40 (minimum), and must have a minimum 0.034-inch (0.864 mm) base-metal thickness (No. 20 gage).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: Design strength of anchors in accordance with the 2009 IBC, 2003 IBC, and the UBC, as well as Section 301.1.3 of the 2009 IRC and 2003 IRC, must be determined in accordance with ACI 318-08 Appendix D and this report. Design strength of anchors in accordance with the 2006 IBC and 2006 IRC must be in accordance with ACI 318-05 Appendix D and this report. Design parameters are based on the 2009 IBC (ACI 318-08) unless noted otherwise in Sections 4.1.1 through 4.1.12 of this report. The strength design of anchors must comply with ACI 318 D.4.1, except as required in ACI 318 D.3.3. Strength reduction factors, ϕ , as given in ACI 318 D.4.4, must be used for load combinations calculated in accordance with Section 1605.2.1 of the IBC, Section 9.2 of ACI 318, or Section 1612.2. of the UBC. Strength reduction factors, ϕ , as given in ACI 318 D.4.5, must be used for load combinations calculated in accordance with ACI 318 Appendix C or Section 1909.2 of the UBC. The value of f'_c used in calculations must be limited to 8,000 psi (55.2 MPa), maximum, in accordance with ACI 318 D.3.5. Strength reduction factors, ϕ , corresponding to ductile steel elements may be used except for the carbon steel 3/8-inch-diameter (9.5 mm) anchors loaded in shear, which have a strength reduction factor corresponding to brittle steel elements.

4.1.2 Requirements for Static Steel Strength in Tension, N_{sa} : The nominal static steel strength of a single anchor in tension, N_{sa} , calculated in accordance with ACI 318, Section D.5.1.2, is given in Tables 3 or 5 of this report.

4.1.3 Requirements for Static Concrete Breakout Strength in Tension, N_{cb} , N_{cbsg} : The nominal concrete breakout strength of a single anchor or a group of anchors in tension, N_{cb} or N_{cbsg} respectively, must be calculated in accordance with ACI 318 D.5.2, with modifications as described in this section. The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.0 MPa). The basic concrete breakout strength of a single anchor in tension, N_b , must be calculated in accordance with ACI 318 D.5.2.2, using the values of h_{ef} and k_{cr} as given in Tables 3 or 5 of this report. The nominal concrete breakout strength in tension in regions where analysis indicates no cracking in accordance with ACI 318 D.5.2.6 must be calculated with $\psi_{c,N} = 1.0$ and using the value of k_{uncr} as given in Tables 3 or 5 of this report.

For anchors installed in the soffit of sand-lightweight or normal-weight concrete-filled steel deck floor and roof assemblies, as shown in Figure 7, calculation of the concrete breakout strength in accordance with ACI 318 D.5.2 is not required.

4.1.4 Requirements for Static Pullout Strength in Tension, N_{pr} : The nominal pullout strength of a single anchor in tension in accordance with ACI 318 D.5.3 in cracked and uncracked concrete, $N_{p,cr}$ or $N_{p,uncr}$, respectively, is given in Tables 3 or 5 of this report. For all design cases, $\psi_{c,P} = 1.0$. In accordance with ACI 318 D.5.3.2, the nominal pullout strength in tension must be calculated according to Eq-1.

$$N_{p,f'c} = N_{p,cr} \sqrt{\frac{f'_c}{2,500}} \text{ (lb, psi)} \quad \text{(Eq-1)}$$

$$N_{p,f'c} = N_{p,cr} \sqrt{\frac{f'_c}{17.2}} \text{ (N, MPa)}$$

In regions where analysis indicates no cracking in accordance with ACI 318 D.5.3.6, the nominal pullout strength in tension must be calculated according to Eq-2:

N_p,f'c = N_p,uncr * sqrt(f_c / 2,500) (lb, psi) (Eq-2)

N_p,f'c = N_p,uncr * sqrt(f_c / 17.2) (N, MPa)

Where values for N_p,cr or N_p,uncr are not provided in Tables 3 or 5 of this report, the pullout strength in tension need not be evaluated.

The nominal pullout strength in tension of the anchors installed in the soffit of sand lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 7 of this report, is given in Table 9. In accordance with ACI 318 D.5.3.2, the nominal pullout strength in cracked concrete must be calculated according to Eq-1, whereby the value of N_p,dock,cr must be substituted for N_p,cr and the value 3,000 psi or 20.7 MPa must be substituted for 2,500 psi or 17.2 MPa. In regions where analysis indicates no cracking in accordance with ACI 318 D.5.3.6, the nominal pullout strength in tension must be calculated according to Eq-2, whereby the value of N_p,dock,uncr must be substituted for N_p,uncr and the value 3,000 psi or 20.7 MPa must be substituted for 2,500 psi or 17.2 MPa.

4.1.5 Requirements for Static Steel in Shear, V_sa: The values of V_sa for a single anchor given in Tables 4 or 6 of this report must be used in lieu of the values of V_sa derived by calculation according to ACI 318 D.6.1.2.

The shear strength, V_sa,dock, of anchors installed in the soffit of sand lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 7 of this report, is given in Table 9 of this report.

4.1.6 Requirements for Static Concrete Breakout Strength in Shear, V_cb or V_cbq: The nominal static concrete breakout strength in shear of a single anchor or a group of anchors, V_cb or V_cbq, must be calculated in accordance with ACI 318 D.6.2. The basic concrete breakout strength in shear of a single anchor in cracked concrete, V_b, must be calculated in accordance with ACI 318 D.6.2.2 using the value of d_n, given in Table 2 of this report, and the value l_e, given in Tables 4 or 6, must be taken no greater than h_ut. In no cases must l_e exceed 8d_n.

For anchors installed in the soffit of sand lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 7, calculation of the concrete breakout strength in accordance with ACI 318 D.6.2 is not required.

4.1.7 Requirements for Static Concrete Pryout Strength of Anchor in Shear, V_cp or V_cpq: The nominal static concrete pryout strength in shear of a single anchor or groups of anchors, V_cp or V_cpq, must be calculated in accordance with ACI 318 D.6.3, modified by using the value of k_cp provided in Tables 4 and 6 of this report and the value of N_cb or N_cbq as calculated in Section 4.1.3 of this report.

For anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 7 of this report, calculation of the concrete pryout strength in accordance with ACI 318 D.6.3 is not required.

4.1.8 Requirements for Minimum Member Thickness, Minimum Anchor Spacing and Minimum Edge Distance: Values of C_min and S_min as given in Table 2 of

this report must be used in lieu of ACI 318 D.8.3. Minimum member thicknesses, h_min, as given in Tables 2 through 6 of this report, must be used in lieu of ACI 318 D.8.5.

For anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, the anchors must be installed in accordance with Figure 7 of this report and the minimum anchor spacing along the flute must be the greater of 3h_ut or 1.5 times the flute width.

4.1.9 Requirements for Critical Edge Distance and Splitting: In applications where c < C_ac and supplemental reinforcement to control splitting of the concrete is not present, the concrete breakout strength in tension for uncracked concrete, calculated according to ACI 318 D.5.2, must be further multiplied by the factor psi_cp,N given by Eq-3:

psi_cp,N = c / C_ac (Eq-3)

Whereby the factor psi_cp,N need not be taken as less than 1.5h_ut / C_ac. For all other cases psi_cp,N = 1.0. Values for the critical edge distance C_ac must be taken from Tables 3 or 5 of this report.

4.1.10 Requirements for Seismic Design:

4.1.10.1 General: For load combinations including earthquake, the design must be performed according to ACI 318 D.3.3 as modified by Section 1908.1.9 of the 2009 IBC or Section 1908.1.16 of the 2006 IBC, as follows:

Table with 3 columns: CODE, ACI 318 D.3.3 SEISMIC REGION, EQUIVALENT CODE DESIGNATION. Rows include 2003 IBC and 2003 IRC, and UBC.

The nominal steel strength and the nominal concrete breakout strength for anchors in tension, and the nominal concrete breakout strength and pryout strength for anchors in shear, must be calculated according to ACI 318 D.5 and D.6, respectively, taking into account the corresponding values given in Tables 3 and 4 or Tables 5 and 6 of this report.

The carbon steel 1/2-inch- (12.7 mm) 5/8-inch (15.9 mm) and 3/4-inch-diameter (19.1 mm) anchors, along with the 3/8-inch-diameter (9.5 mm) anchor loaded in tension, comply with ACI 318 D.1 as ductile steel elements and must be designed in accordance with ACI 318-08 D.3.3.4 D.3.3.5, or D.3.3.6 or ACI 318-05 D.3.3.4 or D.3.3.5. The carbon steel 3/8-inch-diameter (9.5 mm) anchor loaded in shear must be designed in accordance with ACI 318-08 D.3.3.5 or D.3.3.6 or ACI 318-05 D.3.3.6 as brittle steel elements.

The stainless steel 1/2-inch- (12.7 mm) and 5/8-inch (15.9 mm) anchors comply with ACI 318 D.1 as ductile steel elements and must be designed in accordance with ACI 318-08 D.3.3.4, D.3.3.5 or D.3.3.6 or ACI 318-05 D.3.3.4 or D.3.3.5.

4.1.10.2 Seismic Tension: The nominal steel strength and nominal concrete breakout strength for anchors in tension must be calculated according to ACI 318 D.5.1 and D.5.2, as described in Sections 4.1.2 and 4.1.3 of this report and in accordance with ACI 318 D.5.3.2. The value for nominal pullout strength tension for seismic loads, N_eq or N_p,dock,cr, given in Table 3, 5 or 9 of this report, must be used in lieu of N_p. The values of N_eq must be adjusted for the concrete strength in accordance with Eq-4:

N_eq,f'c = N_eq * sqrt(f_c / 2,500) (lb, psi) (Eq-4)

N_eq,f'c = N_eq * sqrt(f_c / 17.2) (N, MPa)

The value of N_p,dock,cr must be calculated according to Eq-4, whereby the value 3,000 psi or 20.7 MPa must be substituted for 2,500 psi or 17.2 MPa.

If no values for N_eq are given in Tables 3 or 5, the static design strength values govern. Section 4.1.4 provides additional requirements.

4.1.10.3 Seismic Shear: The nominal concrete breakout strength and pryout strength for anchors in shear must be calculated according to ACI 318 D.6.2 and D.6.3, as described in Sections 4.1.6 and 4.1.7 of this report and in accordance with ACI 318 D.6.1.2. The value for nominal steel strength in shear for seismic loads, V_eq, or V_sa,dock, given in Tables 4, 6 or 9 of this report, must be used in lieu of V_sa.

4.1.11 Interaction of Tensile and Shear Forces: For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318 D.7.

4.1.12 Requirements for Sand Lightweight Concrete: For ACI 318-08, when anchors are used in sand-lightweight concrete, the modification factor lambda for concrete breakout strength must be taken as 0.6. In addition, the pullout strength N_p,uncr, and N_eq must be multiplied by 0.60, as applicable. For ACI 318-05, the values N_b, N_eq, N_p,uncr, and V_b determined in accordance with this report must be multiplied by 0.60, in lieu of ACI 318 D.3.4. For anchors installed in the soffit of sand-lightweight concrete-filled steel deck floor and roof assemblies, this reduction is not required.

4.2 Allowable Stress Design (ASD):

4.2.1 General: For anchors designed using load combinations in accordance with IBC Section 1605.3 or UBC Section 1612.3, allowable loads must be established using Eq-5 and Eq-6:

T_allowable,ASD = phi*N_t/a (Eq-5)

V_allowable,ASD = phi*V_t/a (Eq-6)

where T_allowable,ASD = Allowable tension load (lbf or kN).

V_allowable,ASD = Allowable shear load (lbf or kN).

phi*N_t = Lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318 Appendix D with amendments in Section 4.1 of this report and Section 1908.1.9 of the 2009 IBC or Section 1908.1.16 of the 2006 IBC, as applicable.

phi*V_t = Lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318 Appendix D with amendments in Section 4.1 of this report and Section 1908.1.9 of the 2009 IBC or Section 1908.1.16 of the 2006 IBC, as applicable.

alpha = Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, alpha must include all applicable factors to account for nonductile failure modes and required over-strength.

An example of allowable stress design values for illustrative purposes is shown in Table 7 of this report.

4.2.2 Interaction of Tensile and Shear Forces: In lieu of ACI 318 D.7.1, D.7.2 and D.7.3, interaction must be calculated as follows:

For shear loads V <= 0.2 V_allowable,ASD, the full allowable load in tension, T_allowable,ASD, may be taken.

For tension loads T <= 0.2 T_allowable,ASD, the full allowable load in shear, V_allowable,ASD, may be taken.

For all other cases, Eq-7 applies:

T/T_allowable,ASD + V/V_allowable,ASD <= 1.2 (Eq-7)

4.3 Installation:

Installation parameters are provided in Tables 2 and 8 and Figures 4, 5, and 6 of this report. Anchor locations must comply with this report and the plans and specifications approved by the code official. The Trubolt+ Wedge Anchors must be installed according to ITW's published instructions and this report. Holes must be predrilled in concrete with a compressive strength from 2,500 to 8,500 psi (17.2 to 58.6 MPa) at time of installation, using carbide-tipped masonry drill bits manufactured within the range of the maximum and minimum drill tip dimensions of ANSI Standard B212.15-1994. The nominal drill bit diameter must be equal to that of the anchor size. The minimum drilled hole depth, h_o, must comply with Table 2 of this report. Embedment, spacing, edge distance, and minimum concrete thickness must comply with Table 2. The predrilled holes must be cleaned to remove loose particles, using pressurized air or a vacuum. For the RED HEAD Trubolt+ Wedge Anchor, the hex nut and washer must be assembled on the end of the anchor, leaving the nut flush with the end of the anchor. For the Sammys Trubolt+ Wedge Anchor, the coupling nut and washer must be assembled on the end of the anchor to obtain at least 1/2 inch (12.7 mm) thread engagement on the anchor). The anchors must be hammered into the predrilled hole to the required embedment depth in concrete. Where a fixture is installed, the anchors must be hammered through the fixture into the predrilled hole to the required embedment depth into the concrete. The nut must be tightened against the washer until the specified torque values listed in Table 2 are achieved.

For installation in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, the hole diameter in the steel deck must not exceed the diameter of the hole in the concrete by more than 1/16 inch (3.2 mm). For member thickness, edge distance, spacing restrictions, and installations torque values for installation into the soffit of sand lightweight or normal-weight concrete on steel deck floor and roof assemblies, see Figure 7, Table 8, and Section 4.1.8 of this report.

4.4 Special Inspection:

Special inspection is required in accordance with Section 1704.15 of the 2009 IBC, Section 1704.13 of the 2006 or 2003 IBC and Section 1701.5.2 of the UBC. The special inspector must make periodic inspections during anchor installation to verify anchor type, anchor dimensions, concrete type, concrete compressive strength, drill bit type, hole dimensions, hole cleaning procedures, edge distance

anchor spacing, concrete member thickness, anchor embedment, tightening torque, and adherence to the manufacturer's published installation instructions. The special inspector must be present as often as required in accordance with the statement of special inspection. Under the IBC, additional requirements as set forth in Sections 1705, 1706, and 1707 must be observed, where applicable.

5.0 CONDITIONS OF USE

The Trubolt+ Wedge Anchors described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions.

- 5.1 The anchors must be installed in accordance with ITW's published instructions and this report. In case of conflicts, this report governs.
- 5.2 Anchor sizes, dimensions, and installation parameters are as set forth in this report.
- 5.3 The anchors are limited to installation in cracked and uncracked, normal-weight or sand-lightweight concrete having a specified compressive strength, f'_c , of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). The anchors may also be installed in cracked and uncracked normal-weight or sand-lightweight concrete over profile steel deck having a minimum specified compressive strength, f'_c , of 3,000 psi (20.7 MPa).
- 5.4 The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.0 MPa).
- 5.5 Strength design values must be established in accordance with Section 4.1 of this report.
- 5.6 Allowable design values must be established in accordance with Section 4.2 of this report.
- 5.7 Anchor spacing, edge distance, and minimum member thickness must comply with Tables 2 and 8 and Figures 4, 5, and 6 of this report.
- 5.8 Prior to installation, calculations and details justifying that the applied loads comply with this report must be submitted to the code official for approval. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.9 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of expansion anchors subjected to fatigue or shock loading is unavailable at this time, the use of these anchors under such conditions is beyond the scope of this report.

- 5.10 Anchors may be installed in regions of concrete where cracking has occurred or where analysis indicates cracking may occur ($f_i > f_c$), subject to the conditions of this report.
- 5.11 Anchors may be used to resist short-term loading due to wind or seismic forces, subject to the conditions of this report.
- 5.12 Where not otherwise prohibited in the code, Trubolt+ Wedge Anchors are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:
 - Anchors are used to resist wind or seismic forces only.
 - Anchors that support a fire-resistance-rated envelope or a fire-resistance-rated membrane are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
 - Anchors are used to support nonstructural elements.
- 5.13 Use of the zinc plated, carbon steel anchors is limited to dry, interior locations.
- 5.14 Special inspections are provided in accordance with Section 4.4 of this report.
- 5.15 The anchors are manufactured in the USA; under a quality control program with inspections by PFS Corporation (AA-652).

6.0 EVIDENCE SUBMITTED

Data complying with the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193), dated February 2010, for use in cracked and uncracked concrete, including optional tests for seismic tension and shear; profile steel deck soffit tests; and quality control documentation.

7.0 IDENTIFICATION

The anchors are identified by their dimensional characteristics and the anchor size, and by a length identification marking stamped on the anchor, as indicated in Table 1 of this report. The anchors have the length identification marking underlined on the anchor head, as illustrated in Figure 3 of this report, and this is visible after installation for verification. Packages are identified with the anchor name, material (carbon or stainless) type and size; the manufacturer's name (ITW Red Head, ITW Brands, or ITW Buildex) and address; the evaluation report number (ICC-ES ESR-2427); and the name of the inspection agency (PFS Corporation).

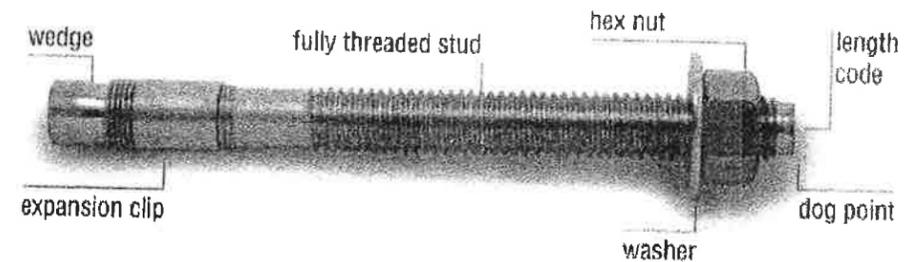


FIGURE 1—ITW RED HEAD TRUBOLT+ WEDGE ANCHOR (Carbon and Stainless Steel)

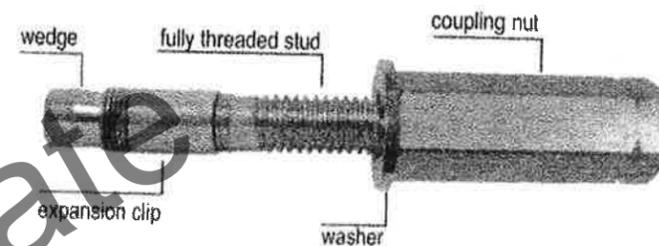


FIGURE 2—SAMMYS TRUBOLT+ WEDGE ANCHOR

TABLE 1—LENGTH IDENTIFICATION MARKINGS¹

LENGTH (Inches)	ID MARKING ON ANCHOR HEAD												
	C	D	E	F	G	H	I	J	K	L	M	N	O
From	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2
Up to, but not including	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9

For SI: 1 inch = 25.4 mm.

¹Figure 3 shows a typical marking.



FIGURE 3—TRUBOLT+ WEDGE ANCHOR LENGTH IDENTIFICATION MARKING

TABLE 2—ITW RED HEAD TRUBOLT+ WEDGE ANCHOR AND SAMMYS TRUBOLT+ WEDGE ANCHOR INSTALLATION INFORMATION (CARBON STEEL AND STAINLESS STEEL)¹

PARAMETER	NOTATION	UNITS	NOMINAL ANCHOR DIAMETER (Inch)										
			$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$			
Anchor outer diameter	$d_a[d_o]$ ³	inches	0.361	0.5	0.615	0.7482							
Nominal carbide bit diameter	d_{bit}	inches	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$							
Effective embedment depth	h_{ef}	inches	$1\frac{5}{8}$	2	$3\frac{1}{4}$	$2\frac{3}{4}$	$4\frac{1}{4}$	$3\frac{3}{4}$					
Minimum anchor embedment depth	h_{nom}	inches	2	$2\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}$	$4\frac{3}{8}$					
Minimum hole depth ¹	h_o	inches	$2\frac{1}{4}$	$2\frac{3}{4}$	4	$3\frac{1}{2}$	5	$4\frac{5}{8}$					
Minimum concrete member thickness ¹	h_{min}	inches	4	5	4	6	6	8	6	$6\frac{1}{4}$	7	8	
Critical edge distance ¹	c_{eo}	in.	5	3	6	6	$7\frac{1}{2}$	6	$7\frac{1}{2}$	$6\frac{1}{2}$	12	10	
Minimum anchor spacing ¹	s_{min}	in.	$3\frac{1}{2}$	$2\frac{1}{2}$	6	$5\frac{3}{4}$	4	$5\frac{3}{4}$	8	6	6	6	
Minimum edge distance ²	c_{min}	in.	3		6		$7\frac{1}{2}$	5	$7\frac{1}{2}$	$7\frac{1}{2}$			
Minimum overall anchor length	l_{anchor}	inches	$2\frac{1}{2}$	$3\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{1}{4}$	6	$5\frac{1}{2}$					
Installation torque	T_{inst}	ft-lb	30		45		90	110					
Minimum diameter of hole in fastened part	d_h	inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$						

For SI: 1 inch = 25.4 mm, 1 ft-lb = 1.356 N-m.

¹Stainless steel anchors are available in $\frac{1}{2}$ -inch and $\frac{3}{4}$ -inch-diameters. The Sammys version is available in a carbon steel $\frac{3}{8}$ -inch-diameter.
²For installation of the carbon steel anchors in the soffit of concrete on steel deck floor or roof assemblies, see Figure 7. Anchors in the lower end in the upper flute may be installed with a maximum 1-inch offset in either direction from the center of the flute. In addition, anchors must have an axial spacing along the flute equal to the greater of $3h_{ef}$ or 1.5 times the flute width.
³The notation in brackets is for the 2006 IBC.

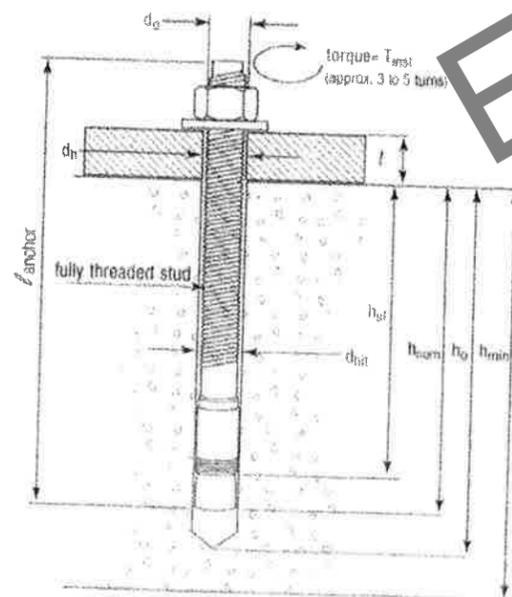


FIGURE 4—ITW RED HEAD TRUBOLT+ WEDGE ANCHOR (INSTALLED)

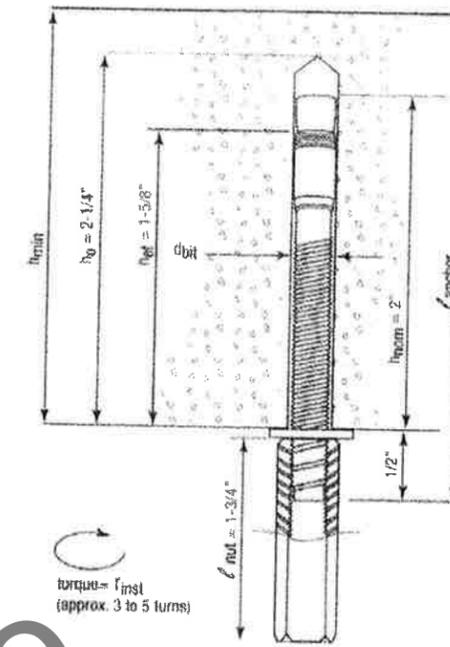
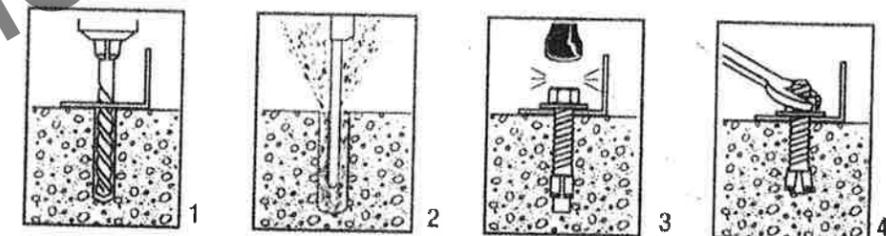


FIGURE 5—SAMMYS TRUBOLT+ WEDGE ANCHOR (INSTALLED), $\frac{3}{8}$ INCH NOMINAL ANCHOR DIAMETER (d_o)



1. Select a carbide drill bit with a diameter equal to the anchor diameter. Drill hole $\frac{1}{4}$ " deeper than anchor embedment.
2. Clean hole with pressurized air or vacuum to remove any excess dust/debris.
3. Using the washer and nut provided, assemble the anchor, leaving nut one half turn from the end of anchor to protect threads. Drive anchor through fixture to be fastened until washer is flush to surface of fixture.
4. Expand anchor by tightening nut to the specified setting torque (approx 3-5 turns).

FIGURE 6—INSTALLATION INSTRUCTIONS

TABLE 3—ITW RED HEAD CARBON STEEL TRUBOLT+ WEDGE ANCHOR AND SAMMYS TRUBOLT+ WEDGE ANCHOR TENSION DESIGN INFORMATION^{1,2,3,10}

CHARACTERISTIC	SYMBOL ⁷	UNITS	NOMINAL ANCHOR DIAMETER (Inch) ⁸									
			³ / ₈		¹ / ₂		⁵ / ₈		³ / ₄			
Anchor category	1, 2 or 3	—	1		1		1		1			
Minimum effective embedment depth	h_{ef}	In.	¹ / ₂		2		3 ¹ / ₄		3 ³ / ₄			
Minimum concrete member thickness	h_{min}	In.	4	5	4	6	6	8	6	6 ¹ / ₄	7	8
Critical edge distance	c_{ec}	In.	5	3	6	6	7 ¹ / ₂	6	7 ¹ / ₂	6 ¹ / ₂	12	10
Data for Steel Strengths – Tension												
Minimum specified yield strength	f_y	psi	60,000		55,000		55,000		55,000		55,000	
Minimum specified ultimate strength	f_{uta}	psi	75,000		75,000		75,000		75,000		75,000	
Effective tensile stress area (neck)	$A_{se,N} [A_{se}]^9$	in ²	0.056		0.119		0.183		0.266		0.266	
Steel strength in tension	N_{sa}	lbf	4,200		8,925		13,725		19,950		19,950	
Strength reduction factor ϕ for tension, steel failure modes ⁴	ϕ	—	0.75		0.75		0.75		0.75		0.75	
Data for Concrete Breakout Strengths in Tension												
Effectiveness factor - uncracked concrete	k_{uncr}	—	24		24		24		24		24	
Effectiveness factor - cracked concrete	k_{cr}	—	17		17		17		17		17	
Modification factor for cracked and uncracked concrete ⁵	$\psi_{c,N}$	—	1.0		1.0		1.0		1.0		1.0	
Strength reduction factor ϕ for tension, concrete failure modes, Condition B ⁴	ϕ	—	0.65		0.65		0.65		0.65		0.65	
Data for Pullout Strengths												
Pullout strength, uncracked concrete	$N_{p,uncr}$	lbf	See Footnote 8	See Footnote 8	6,540	5,430	8,900	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8
Pullout strength, cracked concrete	$N_{p,cr}$	lbf	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8
Pullout strength for seismic loads	N_{eq}	lbf	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	6,715	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8
Strength reduction factor ϕ for tension, pullout failure modes, Condition B ⁴	ϕ	—	See Footnote 8	0.65	0.65	0.65	0.65	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8	See Footnote 8
Additional Anchor Data												
Axial stiffness in service load range in uncracked concrete	β_{uncr}	lbf/in	100,000		250,000		250,000		250,000		250,000	
Axial stiffness in service load range in cracked concrete	β_{cr}	lbf/in	40,000		20,000		20,000		20,000		20,000	

For SI: 1 inch = 25.4 mm, 1 in² = 645.16 mm², 1 lbf = 4.45 N, 1 psi = 0.006895 MPa, 1 lbf · 10²/in = 17,500 N/m.

¹The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations, the additional requirements of ACI 318 D.3.3 shall apply.

²Installation must comply with the manufacturers printed installation instructions and details.

³The ³/₈-, ¹/₂-, ⁵/₈-, and ³/₄-inch diameter Trubolt + Wedge Anchors are ductile steel elements as defined by ACI 318 D.1.

⁴All values of ϕ apply to the load combinations of IBC Section 1605.2, ACI 318 Section 9.2 or UBC Section 1612.2. If the load combinations of Appendix C or UBC Section 1909.2 are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5. For installations where reinforcement that complies with ACI 318 Appendix D requirements for Condition A is present, the appropriate ϕ factor must be determined in accordance with ACI 318 D.4.4.

⁵For all design cases $\psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.

⁶The actual diameter for the 3/8-inch diameter anchor is 0.361 inch, for the 5/8-inch diameter anchor is 0.615-inch, and for the 3/4-inch diameter anchor is 0.7482-inch.

⁷For 2003 IBC code basis, replace f_{uta} with f_{ut} ; N_{sa} with N_s ; $\psi_{c,N}$ with ψ_s ; and N_{eq} with $N_{p,seis}$.

⁸Anchor pullout strength does not control anchor design. Determine steel and concrete capacities only.

⁹The notation in brackets is for the 2006 IBC.

¹⁰The Sammys version is available in a carbon steel 3/8-inch-diameter only.

TABLE 4—ITW RED HEAD CARBON STEEL TRUBOLT+ WEDGE ANCHOR AND SAMMYS TRUBOLT+ WEDGE ANCHOR SHEAR DESIGN INFORMATION^{1,2,3,9}

CHARACTERISTIC	SYMBOL ⁶	UNITS	NOMINAL ANCHOR DIAMETER (Inch) ⁵									
			³ / ₈		¹ / ₂		⁵ / ₈		³ / ₄			
Anchor category	1, 2 or 3	—	1		1		1		1			
Minimum effective embedment depth	h_{ef}	In.	¹ / ₂		2		3 ¹ / ₄		3 ³ / ₄			
Minimum concrete member thickness	h_{min}	In.	4	5	4	6	6	8	6	6 ¹ / ₄	7	8
Critical edge distance	c_{ec}	In.	5	3	6	6	7 ¹ / ₂	6	7 ¹ / ₂	6 ¹ / ₂	12	10
Data for Steel Strengths – Shear												
Minimum specified yield strength	f_y	psi	60,000		55,000		55,000		55,000		55,000	
Minimum specified ultimate strength	f_{uta}	psi	75,000		75,000		75,000		75,000		75,000	
Effective shear stress area (thread)	$A_{se,V} [A_{se}]^9$	in ²	0.075		0.142		0.217		0.332		0.332	
Steel strength in shear, uncracked or cracked concrete	V_{sa}	lbf	1,830		5,175		8,955		14,970		14,970	
Steel strength in shear - seismic loads	V_{sa}	lbf	1,545		5,175		8,955		11,775		11,775	
Strength reduction factor ϕ for shear, steel failure modes ⁴	ϕ	—	0.60		0.65		0.65		0.65		0.65	
Data for Concrete Breakout and Concrete Pryout Strengths – Shear												
Coefficient for pryout strength	k_{cp}	—	1.0		1.0		2.0		2.0		2.0	
Load-bearing length of anchor	l_o	in	¹ / ₂		2		3 ¹ / ₄		2 ³ / ₄		4 ¹ / ₄	
Strength reduction factor ϕ for shear, concrete failure modes, Condition B ⁴	ϕ	—	0.70		0.70		0.70		0.70		0.70	

For SI: 1 inch = 25.4 mm, 1 in² = 645.16 mm², 1 lbf = 4.45 N, 1 psi = 0.006895 MPa, 1 lbf · 10²/in = 17,500 N/m.

¹The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations, the additional requirements of ACI 318 D.3.3 shall apply.

²Installation must comply with the manufacturers printed installation instructions and details.

³The ¹/₂-, ⁵/₈-, and ³/₄-inch diameter Trubolt + Wedge Anchors are ductile steel elements as defined by ACI 318 D.1. The ³/₈-inch diameter Trubolt + is considered brittle under shear loading.

⁴All values of ϕ apply to the load combinations of IBC Section 1605.2, ACI 318 Section 9.2 or UBC Section 1612.2. If the load combinations of Appendix C or UBC Section 1909.2 are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5. For installations where reinforcement that complies with ACI 318 Appendix D requirements for Condition A is present, the appropriate ϕ factor must be determined in accordance with ACI 318 D.4.4.

⁵The actual diameter for the ³/₈-inch diameter anchor is 0.361-inch, for the ⁵/₈-inch diameter anchor is 0.615-inch, and for the ³/₄-inch diameter anchor is 0.7482-inch.

⁶For 2003 IBC code basis, replace f_{uta} with f_{ut} ; V_{sa} with V_s ; $\psi_{c,V}$ with ψ_s ; V_{sa} with $V_{p,seis}$; and l_o with l .

⁷Steel strength in shear values are based on test results per ACI 355.2, Section 9.4 and must be used for design.

⁸The notation in brackets is for the 2006 IBC.

⁹The Sammys version is available in a carbon steel 3/8-inch-diameter only.

TABLE 5—ITW RED HEAD STAINLESS STEEL TRUBOLT+ WEDGE ANCHOR TENSION DESIGN INFORMATION^{1,2,3}

CHARACTERISTIC	SYMBOL ⁷	UNITS	NOMINAL ANCHOR DIAMETER (inch) ⁵								
			1/2			5/8					
Anchor category	1, 2 or 3	—	1			1					
Minimum effective embedment depth	h_{ef}	in.	2		3 1/4		2 3/4		4 1/4		
Minimum concrete member thickness	h_{min}	in.	4	6	6	8	6	6 1/4			
Critical edge distance	c_{ac}	in.	6	6	7 1/2	6	7 1/2	6 1/2			
Data for Steel Strengths - Tension											
Minimum specified yield strength	f_y	psi	65,000						65,000		
Minimum specified ultimate strength	f_{ult}	psi	100,000						100,000		
Effective tensile stress area (neck)	$A_{se,N} [A_{se}]^p$	in ²	0.119						0.183		
Steel strength in tension	N_{st}	lbf	11,900						18,300		
Strength reduction factor ϕ for tension, steel failure modes ⁴	ϕ	—	0.75						0.75		
Data for Concrete Breakout Strengths in Tension											
Effectiveness factor - uncracked concrete	k_{unscr}	—	24						24		
Effectiveness factor - cracked concrete	k_{scr}	—	17						17		
Modification factor for cracked and uncracked concrete ⁵	$\psi_{c,N}$	—	1.0						1.0		
Strength reduction factor ϕ for tension, concrete failure modes, Condition B ⁶	ϕ	—	0.65						0.65		
Data for Pullout Strengths											
Pullout strength, uncracked concrete	$N_{p,unscr}$	lbf	See Footnote 8			6,540		5,430		8,900	
Pullout strength, cracked concrete	$N_{p,scr}$	lbf	See Footnote 8								
Pullout strength for seismic loads	N_{eq}	lbf	2,345			See Footnote 8			See Footnote 8		
Strength reduction factor ϕ for tension, pullout failure modes, Condition B ⁶	ϕ	—	0.65						0.65		
Additional Anchor Data											
Axial stiffness in service load range in uncracked concrete	β_{unscr}	lbf/in	250,000						250,000		
Axial stiffness in service load range in cracked concrete	β_{scr}	lbf/in	20,000						20,000		

For SI: 1 inch = 25.4 mm, 1 in² = 645.16 mm², 1 lbf = 4.45 N, 1 psi = 0.006895 MPa, 1 lbf · 10²/in = 17,500 N/m.

¹The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations, the additional requirements of ACI 318 D.3.3 shall apply.

²Installation must comply with the manufacturers printed installation instructions and details.

³The 1/2- and 5/8-inch diameter Trubolt + Wedge Anchors are ductile steel elements as defined by ACI 318 D.1.

⁴All values of ϕ apply to the load combinations of IBC Section 1605.2, ACI 318 Section 9.2 or UBC Section 1612.2. If the load combinations of Appendix C or UBC Section 1909.2 are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5. For installations where reinforcement that complies with ACI 318 Appendix D requirements for Condition A is present, the appropriate ϕ factor must be determined in accordance with ACI 318 D.4.4.

⁵For all design cases $\psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete (k_{scr}) or uncracked concrete (k_{unscr}) must be used.

⁶The actual diameter for the 5/8-inch diameter anchor is 0.615-inch.

⁷For 2003 IBC code basis, replace f_{ult} with f_{ut} ; N_{st} with N_t ; $\psi_{c,N}$ with ψ_s ; and N_{eq} with $N_{p,eq}$.

⁸Anchor pullout strength does not control anchor design. Determine steel and concrete capacities only.

⁹The notation in brackets is for the 2006 IBC.

TABLE 6—ITW RED HEAD STAINLESS STEEL TRUBOLT+ WEDGE ANCHOR SHEAR DESIGN INFORMATION^{1,2,3}

CHARACTERISTIC	SYMBOL ⁸	UNITS	NOMINAL ANCHOR DIAMETER (inch) ⁵							
			1/2			5/8				
Anchor category	1, 2 or 3	—	1			1				
Minimum effective embedment depth	h_{ef}	in.	2		3 1/4		2 3/4		4 1/4	
Minimum concrete member thickness	h_{min}	in.	4	6	6	8	6	6 1/4		
Critical edge distance	c_{ac}	in.	6	6	7 1/2	6	7 1/2	6 1/2		
Data for Steel Strengths - Shear										
Minimum specified yield strength	f_y	psi	65,000						65,000	
Minimum specified ultimate strength	f_{ult}	psi	100,000						100,000	
Effective shear stress area (thread)	$A_{se,V} [A_{se}]^p$	in ²	0.142						0.217	
Steel strength in shear, uncracked or cracked concrete ⁷	V_{sa}	lbf	7,265						10,215	
Steel strength in shear, seismic loads	V_{sa}	lbf	5,805						8,105	
Strength reduction factor ϕ for shear, steel failure modes ⁴	ϕ	—	0.65						0.65	
Data for Concrete Breakout and Concrete Pryout Strengths - Shear										
Coefficient for pryout strength	k_{cp}	—	1.0		2.0		2.0			
Load-bearing length of anchor	l_a	in	2		3 1/4		2 3/4		4 1/4	
Strength reduction factor ϕ for shear, concrete failure modes, Condition B ⁶	ϕ	—	0.70						0.70	

For SI: 1 inch = 25.4 mm, 1 in² = 645.16 mm², 1 lbf = 4.45 N, 1 psi = 0.006895 MPa, 1 lbf · 10²/in = 17,500 N/m.

¹The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations, the additional requirements of ACI 318 D.3.3 shall apply.

²Installation must comply with the manufacturers printed installation instructions and details.

³The 1/2- and 5/8-inch diameter Trubolt + Wedge Anchors are ductile steel elements as defined by ACI 318 D.1.

⁴All values of ϕ apply to the load combinations of IBC Section 1605.2, ACI 318 Section 9.2 or UBC Section 1612.2. If the load combinations of Appendix C or UBC Section 1909.2 are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5. For installations where reinforcement that complies with ACI 318 Appendix D requirements for Condition A is present, the appropriate ϕ factor must be determined in accordance with ACI 318 D.4.4.

⁵The actual diameter for the 5/8-inch diameter anchor is 0.615-inch.

⁶For 2003 IBC code basis, replace f_{ult} with f_{ut} ; V_{sa} with V_s ; $\psi_{c,V}$ with ψ_s ; V_{sa} with $V_{p,seis}$; and l_a with l .

⁷Steel strength in shear values are based on test results per ACI 355.2, Section 9.4 and must be used for design.

⁸The notation in brackets is for the 2006 IBC.

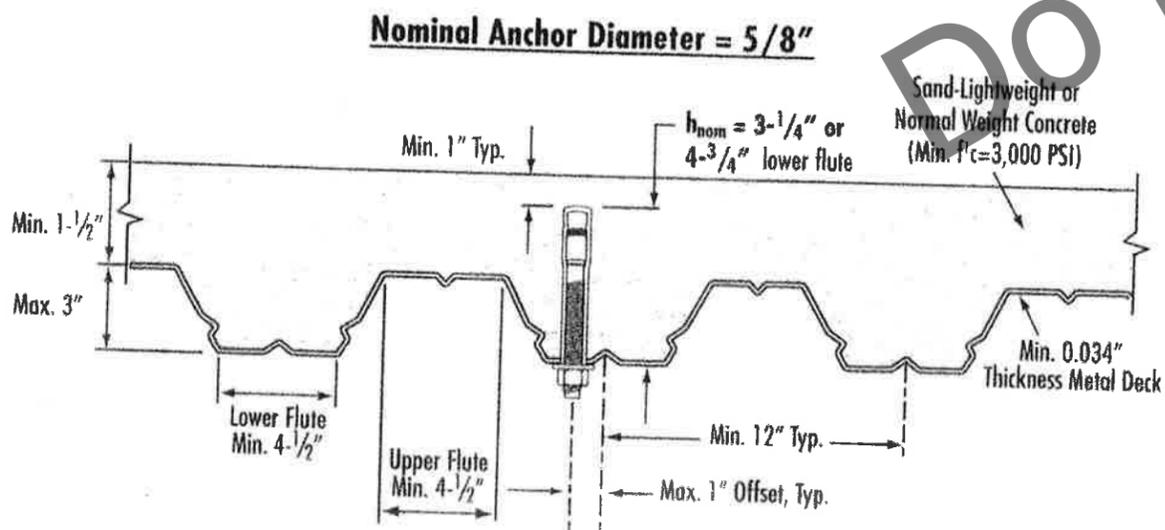
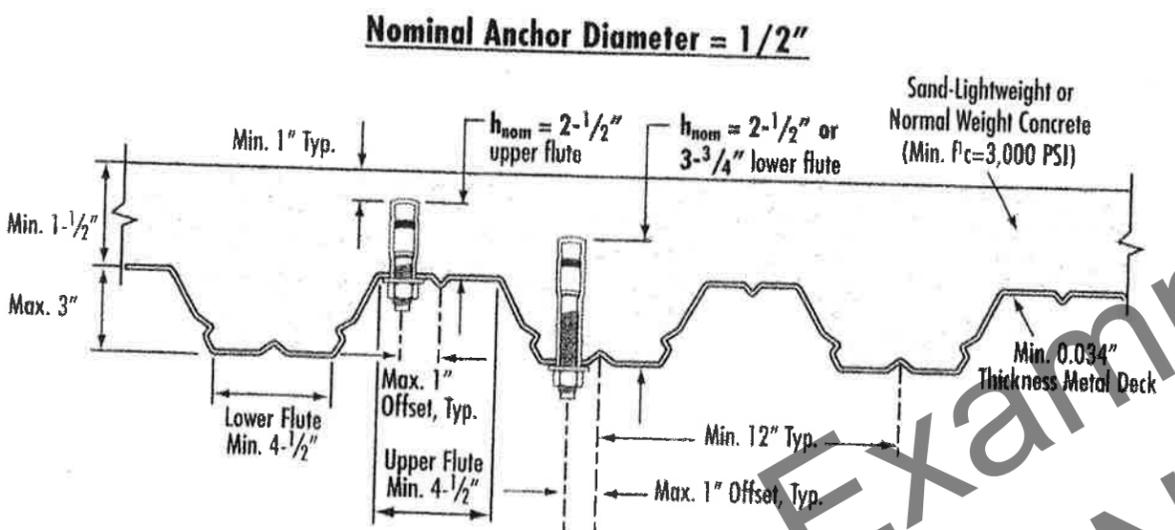
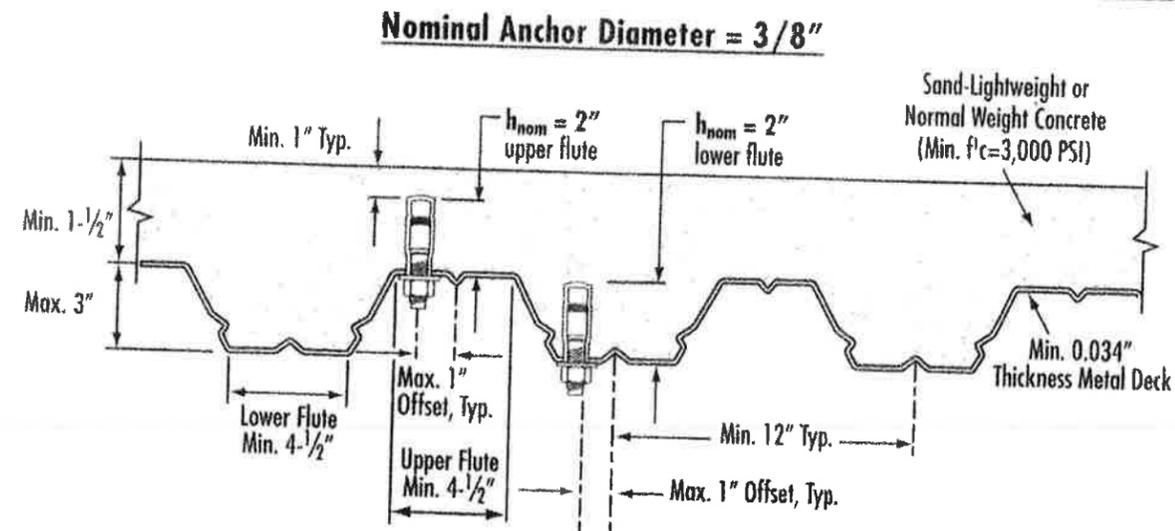


FIGURE 7—TW RED HEAD CARBON STEEL TRUBOLT+ WEDGE ANCHOR AND SAMMYS TRUBOLT+ WEDGE ANCHOR LOCATED IN THE SOFFIT OF CONCRETE OVER STEEL DECK FLOOR AND ROOF ASSEMBLIES (1 inch = 25.4 mm)



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Technical Specifications — Wedge Anchors

Before installing wedge anchors, certain technical specifications should be considered to make certain these concrete fasteners are installed correctly and safely. Wedge anchors come in a variety of anchor diameters, lengths, and thread lengths. Wedge anchors are available in three materials: zinc plated carbon steel, hot-dipped galvanized, and stainless steel. Wedge anchors should be used in solid concrete only.

Wedge Anchor Length:

To determine the length of wedge anchor required, add the thickness of the material to be fastened, plus minimum embedment, plus the thickness of the nut and washer. The sum of these three items equals the minimum wedge anchor length. The Wedge anchor requires no maximum hole depth. The depth of the hole in the base material should be at least the length of the wedge anchor minus the thickness of the material being fastened. This will provide some extra depth to accommodate a minor amount of concrete cuttings which may not be able to be cleaned out of the hole.

Wedge Anchor Spacing:

The forces on a Wedge Anchor are transferred to the base material in which it is installed. If the anchors are installed too close together, it can cause an interaction of the forces, thus reducing the holding power of the anchor. As a rule of thumb, the expansion anchor industry has established a minimum standard of ten (10) anchor diameters for spacing between anchors and five (5) anchor diameters from any unsupported edge. When vibration or sudden impact are part of the load conditions, spacing between anchors should be increased.

Wedge Anchor Ultimate Holding Values**

Anchor Diameter (inches)	Minimum Embedment (inches)	Installation Torque (FT/Lbs.)	Embedment Depth (inches)	2000 PSI Concrete		4000 PSI Concrete	
				Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)
1/4	1-1/8	5-10	1-1/8	1170	1443	1771	1813
			1-3/4	1841	1443	2408	1813
			2-3/4	1975	1443	2748	1813
5/16	1-1/8	5-10	1-1/4	1308	2110	2399	2033
			2	1882	2110	2787	2033
			2-1/4	1805	2110	2810	2033
3/8	1-1/2	25-30	1-1/2	1631	4318	3636	5121
			5	4075	4318	6328	5121
			2-1/4	3999	7419	8714	9377
1/2	2-1/4	50-60	4	6336	7419	8842	9377
			6	6902	7419	10175	9377
			3-3/4	4999	8264	8747	12928
5/8	2-3/4	75-90	5	8854	8264	15580	12928
			7	9381	8264	16710	12928
			3-1/4	6838	12504	11314	17050
3/4	3-1/4	150-175	6	10064	12504	18408	17050
			8	11170	12504	18805	17050
			5-7/8	8392	18250	16314	20254
7/8	3-7/8	200-250	5-3/4	12064	18250	18250	30234

Fig 26.
REV. 3

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			8-3/4	12754	18250	16850	20234
			4-1/2	9773	23617	18250	27605
1	4-1/2	250-300	7-1/2	11890	23617	26726	27605
			10	15590	23617	30491	27605
			5-1/2	17550	32275	22971	42690
1-1/4	5-1/2	400-450	7	21050	32275	27845	42690
			10	27893	32275	34788	42690

*Values shown are average ultimate values and are offered only as a guide and are not guaranteed. A safety factor of 4:1 or 25% is generally accepted as a safe working load. Reference should be made to applicable codes for the specific working ratio. All values are based on close-tolerance holes drilled with carbide tipped drill bits. Designated holding power depends on the quality of the masonry material, depth of embedment, and proper hole size.

Zinc Plated Part #	Hot Dipped Galvanized Part #	Stainless Steel Part #	Diameter (Inches)	Length (Inches)	Thread Length (Inches)	Minimum Embedment (Inches)	Torque (Ft/Lbs)
WA14134	N/A	WAS14134	1/4	1-3/4	3/4	1-1/8	5-10
WA14214	N/A	WAS14214	1/4	2-1/4	3/4 - 1	1-1/8	5-10
WA143	N/A	WAS143	1/4	3	3/4 - 2-1/8	1-1/8	5-10
WA14314	N/A	WAS14314	1/4	3-1/4	3/4 - 2-1/8	1-1/8	5-10
WA516234	WAG516234	WAS516234	5/16	2-3/4	1-1/2	1-1/8	5-10
WA516312	WAG516312	WAS516312	5/16	3-1/2	1-1/2 - 2-1/4	1-1/8	5-10
WA38214	WAG38214	WAS38214	3/8	2-1/4	7/8	1-1/2	25-30
WA38234	WAG38234	WAS38234	3/8	2-3/4	1-1/8 - 1-1/2	1-1/2	25-30
WA383	WAG383	WAS383	3/8	3	1-1/8 - 1-1/2	1-1/2	25-30
WA38312	WAG38312	WAS38312	3/8	3-1/2	1-1/8 - 2-1/4	1-1/2	25-30
WA38334	WAG38334	WAS38334	3/8	3-3/4	1-1/8 - 2-1/2	1-1/2	25-30
WA385	WAG385	WAS385	3/8	5	1-1/8 - 3-1/2	1-1/2	25-30
WA38612	WAG38612	WAS38612	3/8	6-1/2	1-1/8 - 4-1/4	1-1/2	25-30
WA12234	WAG12234	WAS12234	1/2	2-3/4	2-1/4	2-1/4	50-60
WA12334	WAG12334	WAS12334	1/2	3-3/4	2-1/4	2-1/4	50-60
WA12414	WAG12414	WAS12414	1/2	4-1/4	2-1/4 - 2-3/4	2-1/4	50-60
WA12512	WAG12512	WAS12512	1/2	5-1/2	2-1/4 - 3-3/4	2-1/4	50-60
WA127	WAG127	WAS127	1/2	7	2-1/4 - 4	2-1/4	50-80
WA12812	WAG12812	WAS12812	1/2	8-1/2	2-1/4 - 4	2-1/4	50-60
WA1210	WAG1210	WAS1210	1/2	10	2-1/4 - 4	2-1/4	50-60
WA1212	WAG1212	WAS1212	1/2	12	2-1/4 - 4	2-1/4	50-60
WA58312	WAG58312	WAS58312	5/8	3-1/2	1-1/8 - 1-3/4	2-3/4	75-90
WA58412	WAG58412	WAS58412	5/8	4-1/2	2-1/4	2-3/4	75-90
WA585	WAG585	WAS585	5/8	5	2-3/4	2-3/4	75-90
WA586	WAG586	WAS586	5/8	6	2-3/4 - 4	2-3/4	75-90
WA587	WAG587	WAS587	5/8	7	2-3/4 - 4	2-3/4	75-90
WA58812	WAG58812	WAS58812	5/8	8-1/2	2-3/4 - 4	2-3/4	75-90
WA5810	WAG5810	WAS5810	5/8	10	2-3/4 - 4	2-3/4	75-90
WA5812	WAG5812	WAS5812	5/8	12	2-3/4 - 4	2-3/4	75-90

WA34414	WAG34414	WAS34414	3/4	4-1/4	1-3/4	3-1/4	150-175
WA34434	WAG34434	WAS34434	3/4	4-3/4	2-1/4	3-1/4	150-175
WA34512	WAG34512	WAS34512	3/4	5-1/2	3	3-1/4	150-175
WA34614	WAG34614	WAS34614	3/4	6-1/4	3-1/4 - 4	3-1/4	150-175
WA347	WAG347	WAS347	3/4	7	3-1/4 - 4	3-1/4	150-175
WA34812	WAG34812	WAS34812	3/4	8-1/2	3-1/4 - 4	3-1/4	150-175
WA3410	WAG3410	WAS3410	3/4	10	3-1/4 - 4	3-1/4	150-175
WA3412	WAG3412	WAS3412	3/4	12	3-1/4 - 4	3-1/4	150-175
WA786	WAG786	WAS786	7/8	6	3	3-7/8	200-250
WA788	WAG788	WAS788	7/8	8	2-1/4 - 4	3-7/8	200-250
WA7810	WAG7810	WAS7810	7/8	10	2-1/4 - 4	3-7/8	200-250
WA7812	WAG7812	WAS7812	7/8	12	2-1/4 - 4	3-7/8	200-250
WA16	WAG16	WAS16	1	6	3	4-1/2	250-300
WA18	WAG18	WAS18	1	9	4	4-1/2	250-300
WA112	WAG112	WAS112	1	12	4	4-1/2	250-300
WA1149	WAG1149	WAS1149	1-1/4	9	4	5-1/2	400-450
WA11412	WAG11412	WAS11412	1-1/4	12	4	5-1/2	400-450

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Pg. 27 | Rev. 3

L.T. AIR CORPORATION

248 Glider Circle
Corona, CA 92880-2533
Tel(951)734-2260 Fax(951)734-2226
CSLB #753788 C-20

January 6, 2012

A PROPOSAL FOR:
PROJECT:

██████████ LANE
MENIFEE, CA 92584

HEATING AND AIR CONDITIONING

L.T. Air Corporation proposes to furnish materials for, fabricate and install the following equipment for the above project, according to the specifications and order noted below, for the following prices:

PRICE	FAU	BTUS	COIL	CONDENSER	TONS	S	R	SEER
\$-----	58STX090116	90,000	ASFM4826A28GVS	CA16NA04800G	4.0	10	1	14.0

FOR HERS TESTING AND CERTIFICATION

1. Prices expire on 12/31/2011.

2. This proposal is based on designs & layouts as prepared by L.T. Corporation.

EQUIPMENT: **BRYANT**

THERMOSTAT: SOURCE 1 DIGITAL

DUCTWORK: Flex R-6.0 (with UL-181 tape), rectangular sheet metal
INCLUDED: Refrigerant lines with R-3 insulation, condenser pad, final condensate line hook ups, glencote (UL-181) at all plenum connections, zip ties at all duct to metal connections, TXV, Bar registers NO/OBD, stamp face returns, 80% AFUE furnace, 13.0 SEER condenser.

NOT INCLUDED: Carpentry, line voltage wiring, low voltage conduit, fire dampers, smoke & fire dampers, fire stopping, combo vents, mechanical permits, mechanical ventilation, bath fans, dryer vents, kitchen hood venting, air balance, combustion air, vibration isolators, site glass, copper traps, crankcase heaters, accumulators, filter driers, condensate lines, hot water supply (for hydronic units only), patching, painting, gas lines, structural strap, bonds, sheet metal cap (@ roof platform), flex connectors at FAU, duct leakage test, refrigerant charge test, HERS testing.

THIS PROPOSAL IS SUBJECT TO ACCEPTANCE BY AN OFFICER OR AUTHORIZED AGENT OF ██████████ AND TO CREDIT APPROVAL BY L.T. AIR CORPORATION.

We thank you for the opportunity of submitting this proposal. If you have any questions regarding it, please call.

Sincerely,
Les Tingley
L.T. Air Corporation

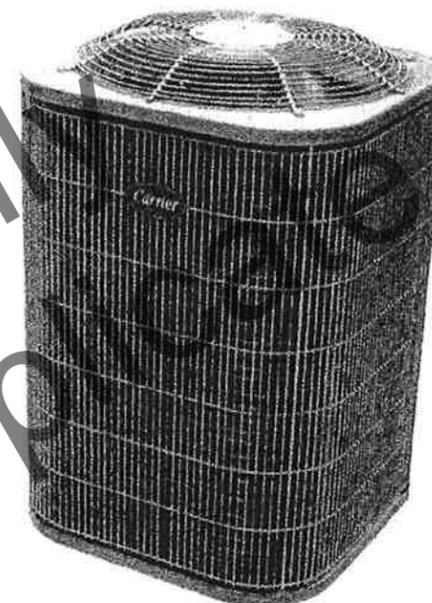
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30% Condenser

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Base™ Series Air Conditioner
with Puron® Refrigerant

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Product Data



Carrier's CA16 has been designed utilizing Carrier's Puron refrigerant. The environmentally sound refrigerant allows you to make a responsible decision in the protection of the earth's ozone layer.

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. Refer to the combination ratings in the Product Data for system combinations that meet Energy Star® guidelines.

NOTE: Ratings contained in this document are subject to change at any time. Always refer to the AHRI directory (www.ahridirectory.org) for the most up-to-date ratings information.

INDUSTRY LEADING FEATURES / BENEFITS

Efficiency

- 14 - 16.5 SEER/11.0- 13.5 EER
- Microtube Technology™ refrigeration system
- Indoor air quality accessories available

Sound

- Sound level as low as 76 dBA
- Sound level as low as 74 dBA with accessory sound blanket

Comfort

- System supports Edge® Thermostat™ or standard thermostat controls

Reliability

- Puron® refrigerant - environmentally sound, won't deplete the ozone layer and low lifetime service cost.
- Scroll compressor
- Internal pressure relief valve
- Internal thermal overload
- Filter drier
- Balanced refrigeration system for maximum reliability

Durability

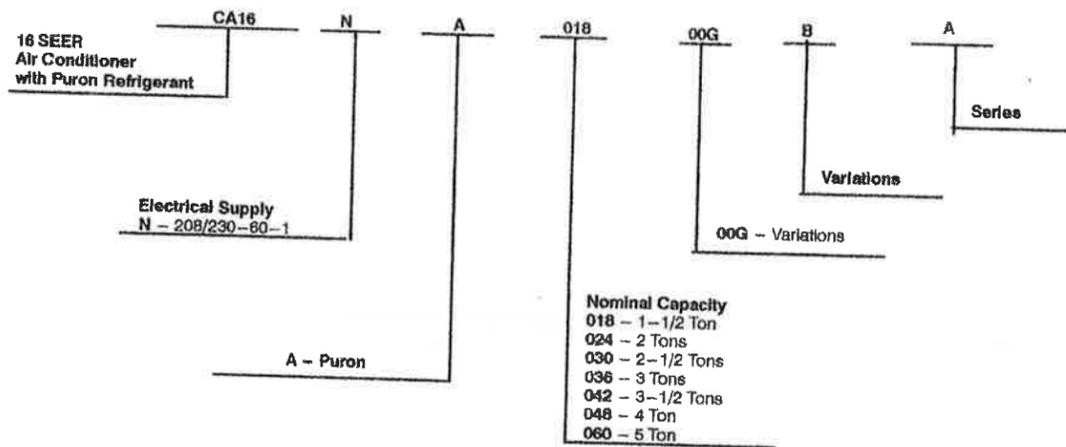
WeatherArmor™ protection package:

- Solid, durable sheet metal construction
- Dense wire coil guard standard
- Baked-on, complete outer coverage, powder paint

Applications

- Long-line - up to 250 feet (76.20 m) total equivalent length, up to 200 feet (60.96 m) condenser above evaporator, or up to 80 ft. (24.38 m) evaporator above condenser (See Longline Guide for more information.)
- Low ambient (down to -20°F/-28.9°C) with accessory kit

MODEL NUMBER NOMENCLATURE



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program for verification of certification for individual products, go to www.ahridirectory.org.



This product has been designed and manufactured to meet Energy Star criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow all manufacturing refrigerant charging and air flow instructions. Failure to confirm proper charge and air flow may reduce energy efficiency and shorten equipment life.

STANDARD FEATURES

Feature	18	24	30	36	42	48 / 49	60 / 61
Puron Refrigerant	X	X	X	X	X	X	X
Maximum SEER *	16.0	16.0	16.5	16.5	16.0	16.0	16.0
Scroll Compressor	X	X	X	X	X	X	X
Field Installed Filter Drier	X	X	X	X	X	X	X
Front Seating Service Valves	X	X	X	X	X	X	X
Internal Pressure Relief Valve	X	X	X	X	X	X	X
Internal Thermal Overload	X	X	X	X	X	X	X
Long Line capability	X	X	X	X	X	X	X
Low Ambient capability with Kit	X	X	X	X	X	X	X
Dense Grille	X	X	X	X	X	X	X

* With approved combinations
 X = Standard

REFRIGERANT PIPING LENGTH LIMITATIONS

Liquid Line Sizing and Maximum Total Equivalent Lengths[†] for Cooling Only Systems with Puron® Refrigerant:

The maximum allowable length of a residential split system depends on the liquid line diameter and vertical separation between indoor and outdoor units.

See Table below for liquid line sizing and maximum lengths :

Maximum Total Equivalent Length
 Outdoor Unit BELOW Indoor Unit

Size	Liquid Line Connection	Liquid Line Diam. w/ TXV	AC with Puron Refrigerant Maximum Total Equivalent Length†: Outdoor unit BELOW Indoor									
			Vertical Separation ft (m)									
			0-5 (0-1.5)	6-10 (1.8-3.0)	11-20 (3.4-6.1)	21-30 (6.4-9.1)	31-40 (9.4-12.2)	41-50 (12.5-15.2)	51-60 (15.5-18.3)	61-70 (18.6-21.3)	71-80 (21.6-24.4)	
18000 AC with Puron	3/8	1/4	150	150	125	100	100	75	---	---	---	
		5/16	250*	250*	250*	250*	250*	250*	250*	225*	150	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
24000 AC with Puron	3/8	1/4	75	75	75	50	50	---	---	---	---	
		5/16	250*	250*	250*	250*	250*	225*	175	125	100	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
30000 AC with Puron	3/8	1/4	30	---	---	---	---	---	---	---	---	
		5/16	175	225*	200	175	125	100	75	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
36000 AC with Puron	3/8	5/16	175	150	150	100	100	100	75	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
		5/16	125	100	100	75	75	50	---	---	---	
42000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
		5/16	125	100	100	75	75	50	---	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	150	
48000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	230	160	
		5/16	175	225*	200	175	125	100	75	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
49000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	230	160	
		5/16	175	225*	200	175	125	100	75	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
60000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	230	160	
		5/16	175	225*	200	175	125	100	75	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	
61000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	230	160	
		5/16	175	225*	200	175	125	100	75	---	---	
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*	

* Maximum actual length not to exceed 200 ft (61 m)

† Total equivalent length accounts for losses due to elbows or fitting. See the Long Line Guideline for details.

--- = outside acceptable range

Maximum Total Equivalent Length
 Outdoor Unit ABOVE Indoor Unit

Size	Liquid Line Connection	Liquid Line Diam. w/ TXV	AC with Puron Refrigerant Maximum Total Equivalent Length†: Outdoor unit ABOVE Indoor							
			Vertical Separation ft (m)							
			25 (7.6)	26-50 (7.9-15.2)	51-75 (15.5-22.9)	76-100 (23.2-30.5)	101-125 (30.8-38.1)	126-150 (38.4-45.7)	151-175 (46.0-53.3)	176-200 (53.8-61.0)
18000 AC with Puron	3/8	1/4	175	250*	250*	250*	250*	250*	250*	250*
		5/16	250*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
24000 AC with Puron	3/8	1/4	100	125	175	200	225*	250*	250*	250*
		5/16	250*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
30000 AC with Puron	3/8	1/4	30	---	---	---	---	---	---	---
		5/16	250*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
36000 AC with Puron	3/8	5/16	225*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
		5/16	175	200	250*	250*	250*	250*	250*	250*
42000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*
		5/16	175	200	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
48000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*
		5/16	175	200	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
49000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*
		5/16	175	200	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
60000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*
		5/16	175	200	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
61000 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*
		5/16	175	200	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*

* Maximum actual length not to exceed 200 ft (61 m)

† Total equivalent length accounts for losses due to elbows or fitting. See the Long Line Guideline for details.

--- = outside acceptable range

REFRIGERANT CHARGE ADJUSTMENTS

Liquid Line Size	Puron Charge oz/ft
3/8	0.60 (Factory charge for lineset = 9 oz)
5/16	0.40
1/4	0.27

Units are factory charged for 15 ft (4.6 m) of 3/8" liquid line. The factory charge for 3/8" lineset 9 oz. When using other length or diameter liquid lines, charge adjustments are required per the chart above.

Charging Formula:

$[(\text{Lineset oz/ft} \times \text{total length}) - (\text{factory charge for lineset})] = \text{charge adjustment}$

Example 1: System has 15 ft of line set using existing 1/4" liquid line. What charge adjustment is required?

Formula: $(.27 \text{ oz/ft} \times 15\text{ft}) - (9 \text{ oz}) = (-4.95) \text{ oz.}$

Net result is to remove 4.95 oz of refrigerant from the system

Example 2: System has 45 ft of existing 5/16" liquid line. What is the charge adjustment?

Formula: $(.40 \text{ oz/ft.} \times 45\text{ft}) - (9 \text{ oz.}) = 9 \text{ oz.}$

Net result is to add 9 oz. of refrigerant to the system

LONG LINE APPLICATIONS

An application is considered Long Line, when the refrigerant level in the system requires the use of accessories to maintain acceptable refrigerant management for systems reliability. See Accessory Usage Guideline table for required accessories. Defining a system as long line depends on the liquid line diameter, actual length of the tubing, and vertical separation between the indoor and outdoor units.

For Air Conditioner systems, the chart below shows when an application is considered Long Line.

AC WITH PURON® REFRIGERANT LONG LINE DESCRIPTION ft (m)

Beyond these lengths, long line accessories are required

Liquid Line Size	Units On Same Level	Outdoor Below Indoor	Outdoor Above Indoor
1/4	No accessories needed within allowed lengths	No accessories needed within allowed lengths	175 (53.3)
5/16	120 (36.6)	50 (15.2)	120 (36.6)
3/8	80 (24.4)	35 (10.7)	80 (24.4)

Note: See Long Line Guideline for details

VAPOR LINE SIZING AND COOLING CAPACITY LOSS

Acceptable vapor line diameters provide adequate oil return to the compressor while avoiding excessive capacity loss. The suction line diameters shown in the chart below are acceptable for AC systems with Puron refrigerant:

Unit Nominal Size (Btu/h)	Maximum Liquid Line Diameters (In. OD)	Vapor Line Diameters (In. OD)	Cooling Capacity Loss (%)																												
			Total Equivalent Line Length ft. (m)																												
			26-50 (7.9-15.2)	51-80 (15.5-24.4)	81-100 (24.7-30.5)	101-125 (30.8-38.1)	126-150 (38.4-45.7)	151-175 (46.0-53.3)	176-200 (53.6-61.0)	201-225 (61.3-68.8)	226-250 (68.9-76.2)																				
18000 1 Stage AC with Puron	3/8	1/2	1	2	3	5	8	8	9	11	3/8	5/8	0	1	1	2	2	3	3	3/8	3/4	0	0	0	1	1	1	1	1		
		7/8	0	0	0	0	0	1	1	2		2	7/8	0	0	0	0	0	1		1	2	2								
24000 1 Stage AC with Puron	3/8	5/8	0	1	2	3	5	6	7	8	3/8	3/4	0	0	1	1	2	2	3	3	3/8	7/8	0	0	0	0	1	1	1	1	1
		7/8	0	0	0	0	0	1	1	2		2	7/8	0	0	0	0	0	1	1		2	2								
30000 1 Stage AC with Puron	3/8	5/8	1	2	3	4	6	8	9	11	3/8	3/4	0	0	1	1	2	2	3	3	3/8	7/8	0	0	0	0	1	1	1	1	1
		7/8	0	0	0	0	1	1	2	2		7/8	0	0	0	0	0	1	1	2		2									
36000 1 Stage AC with Puron	3/8	5/8	1	2	4	5	6	8	9	12	3/8	3/4	0	1	1	2	2	3	4	4	3/8	7/8	0	0	0	1	1	1	1	1	1
		7/8	0	0	0	1	1	2	2	3		3	7/8	0	0	0	0	0	1	1		2	2								
42000 1 Stage AC with Puron	3/8	3/4	0	1	2	2	3	4	5	6	3/8	7/8	0	0	1	1	2	2	3	3	3/8	1 1/8	0	0	0	0	0	0	0	0	0
		7/8	0	0	0	0	0	0	0	0		0	7/8	0	0	0	0	0	0	0		0	0								
48000, 49000 1 Stage AC with Puron	3/8	3/4	0	1	2	3	4	5	6	7	3/8	7/8	0	0	1	1	2	2	3	3	3/8	1 1/8	0	0	0	0	0	0	0	0	0
		7/8	0	0	0	0	0	0	0	0		0	7/8	0	0	0	0	0	0	0		0	0								
60000, 61000 1 Stage AC with Puron	3/8	3/4	1	2	4	5	6	7	9	11	3/8	7/8	0	1	2	2	3	4	5	5	3/8	1 1/8	0	0	0	1	1	1	1	1	1
		7/8	0	0	0	0	0	0	0	0		0	7/8	0	0	0	0	0	0	0		0	0								

Applications in this area may be long line and may have height restrictions. See the Residential Piping and Long Line Guideline.

PHYSICAL DATA

UNIT SIZE-VOLTAGE, SERIES	18-A	24-A	30-A	36-A	42-A	48-A	49-A	60-A	61-A
Operating Weight lb (kg)	125 (56.7)	147 (66.5)	153 (69.3)	165 (74.8)	213 (96.4)	264 (119.7)	291 (104.8)	272 (123.4)	272 (123.4)
Shipping Weight lb (kg)	154 (69.9)	183 (82.8)	188 (85.2)	204 (92.5)	254 (115.2)	317 (143.8)	269 (222.0)	310 (140.6)	310 (140.6)
Compressor Type	Scroll								
REFRIGERANT	Puron® (R-410A)								
Control	TXV (Puron® Hard Shutoff)								
Charge lb (kg)	4.60 (2.09)	6.00 (2.72)	6.81 (3.09)	7.00 (3.18)	8.62 (3.91)	13.0 (5.90)	9.00 (4.08)	14.50 (6.58)	14.50 (6.58)
COND FAN	Propeller Type, Direct Drive								
Air Discharge	Vertical								
Air Qty (CFM)	1881	2614	2614	3223	3810	4046	4046	4046	4046
Motor HP	1/12	1/10	1/10	1/12	1/5	1/4	1/4	1/4	1/4
Motor RPM	1100	1100	1100	800	800	800	800	800	800
COND COIL	Vertical								
Face Area (Sq ft)	11.50	15.10	17.20	17.60	25.15	25.15	25.15	30.15	30.15
Fins per In.	25	25	25	25	25	20	20	20	20
Rows	1	1	1	1	1	2	1	2	2
Circuits	3	4	4	4	6	7	7	8	8
VALVE CONNECT. (In. ID)	Vertical								
Vapor	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8
Liquid	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
REFRIGERANT TUBES (In. OD)	Vertical								
Rated Vapor*	3/4			7/8			1-1/8		
Max Liquid Line †	3/4			3/8			7/8		

* Units are rated with 25 ft (7.6 m) of lineset length. See Vapor Line Sizing and Cooling Capacity Loss table when using other sizes and lengths of lineset.
† See Liquid Line Sizing For Cooling Only Systems with Puron Refrigerant tables.

ELECTRICAL DATA

UNIT SIZE	V/PH	OPER VOLTS*		COMPR			FAN	MCA	MIN WIRE SIZE† 60° C	MIN WIRE SIZE† 75° C	MAX LENGTH ft. (m)‡ 60° C	MAX LENGTH ft. (m)‡ 75° C	MAX FUSE** or CKT BRK AMPS
		MAX	MIN	LRA	RLA	FLA							
18-A	208/230/1-60	253	197	48.0	9.0	0.50	11.5	14	14	67 (20.4)	64 (19.5)	20	
24-A				58.3	13.5	0.75	17.7	14	14	46 (14.0)	43 (13.1)	25	
30-A				64.0	12.8	0.75	16.8	14	14	44 (13.4)	41 (12.5)	25	
36-A				77.0	14.1	0.50	18.1	12	12	57 (17.4)	54 (16.5)	30	
42-A				112.0	17.9	1.20	23.6	10	10	85 (25.9)	81 (24.7)	40	
48-A				109.0	19.0	1.20	26.1	10	10	70 (21.3)	67 (20.4)	40	
49-A				117.0	21.8	1.20	28.4	10	10	70 (21.3)	67 (20.4)	40	
60-A				135.0	21.4	1.20	28.0	8	10	91 (27.7)	56 (17.1)	40	
61-A				134.0	25.0	1.20	32.5	8	10	94 (28.7)	58 (17.7)	50	

* Permissible limits of the voltage range at which the unit will operate satisfactorily
† If wire is applied at ambient greater than 30°C, consult table 310-16 of the NEC (NFPA 70). The ampacity of non-metallic-sheathed cable (NM), trade name ROMEX, shall be that of 60°C conditions, per the NEC (NFPA 70) Article 334-80. If other than uncoated (no-plated), 60 or 75°C insulation, copper wire (solid wire for 10 AWG or smaller, stranded wire for larger than 10 AWG) is used, consult applicable tables of the NEC (NFPA 70).
‡ Length shown is as measured one way along wire path between unit and service panel for voltage drop not to exceed 2%.
** Time-Delay fuse.
FLA - Full Load Amps
LRA - Locked Rotor Amps
MCA - Minimum Circuit Amps
RLA - Rated Load Amps
NOTE: Control circuit is 24-V on all units and requires external power source. Copper wire must be used from service disconnect to unit.
All motors/compressors contain internal overload protection.
Complies with 2007 requirements of ASHRAE Standards 90.1

CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

UNIT SIZE-VOLTAGE, SERIES	REQUIRED SUBCOOLING °F (°C)
18-A	10 (5.6)
24-A	10 (5.6)
30-A	10 (5.6)
36-A	10 (5.6)
42-A	10 (5.6)
48-A	9 (5.0)
49-A	8 (4.4)
60-A	9 (5.0)
61-A	9 (5.0)

A-WEIGHTED SOUND POWER LEVEL (dBA)

Unit Size - Voltage, Series	Standard Rating (dBA)	TYPICAL OCTAVE BAND SPECTRUM (dBA without tone adjustment)							
		125	250	500	1000	2000	4000	8000	
18-A	78	52.5	59.0	65.5	70.5	64.5	59.0	54.5	
24-A	78	57.5	64.0	69.0	71.0	69.0	64.5	60.0	
30-A	78	55.0	63.5	68.0	69.5	67.0	63.5	58.5	
36-A	78	50.5	59.5	64.5	70.5	62.0	59.5	54.5	
42-A	78	62.5	62.0	66.0	73.5	68.0	62.0	55.5	
48-A	78	57.5	61.5	66.0	70.5	65.5	59.5	53.5	
49-A	78	51.5	62.0	67.5	73.5	69.0	64.5	62.0	
60-A	78	55.0	62.5	67.5	70.5	65.0	61.0	53.5	
61-A	78	56.5	63.0	65.5	69.0	67.0	61.5	56.0	

NOTE: Tested in accordance with AHRI Standard 270-08 (not listed in AHRI).

A-WEIGHTED SOUND POWER LEVEL (dBA) WITH SOUND SHIELD

Unit Size - Voltage, Series	Standard Rating (dBA)	TYPICAL OCTAVE BAND SPECTRUM (dBA without tone adjustment)							
		125	250	500	1000	2000	4000	8000	
18-A	74	55.5	59.0	65.0	68.5	63.5	58.0	52.0	
24-A	75	58.0	64.0	69.0	70.5	68.5	64.5	59.5	
30-A	75	55.5	63.0	68.0	69.0	67.0	63.0	58.5	
36-A	74	51.5	58.5	62.0	65.0	61.0	58.0	52.0	
42-A	78	53.0	62.0	65.5	72.0	65.0	61.0	54.0	
48-A	78	58.5	61.5	66.0	69.0	64.0	58.5	51.0	
49-A	78	53.0	61.5	67.5	72.0	68.0	61.5	59.0	
60-A	75	56.5	62.5	66.5	68.0	63.0	59.5	51.5	
61-A	75	57.0	63.0	65.5	67.0	65.5	59.0	52.5	

NOTE: Tested in accordance with AHRI Standard 270-08 (not listed in AHRI).

ACCESSORY THERMOSTATS

PART NUMBER	PROGRAM	GAS	ELECTRIC	HEAT PUMP	HYBRID HEAT	HEAT	COOL
Performance							
TP-PRH01-A	7-Day	✓	✓	✓	✓	3	2
TP-PHP01	7-Day		✓	✓		3	2
TP-PAC01	7-Day	✓	✓			1	1
TP-NRH01-A	NP	✓	✓	✓	✓	3	2
TP-NHP01	NP		✓	✓		3	2
TP-NAC01	NP	✓	✓			1	1
Comfort							
TC-PHP01	5-2 Day		✓	✓		3	2
TC-PAC01	5-2 Day	✓	✓			1	1
TC-NHP01	NP		✓	✓		3	2
TC-NAC01	NP	✓	✓			1	1
TCSNHP01	NP		✓	✓		2	1
TCSNAC01	NP	✓	✓			1	1
Base							
TB-PHP01	5-2 Day	✓	✓	✓		2	1
TB-PAC01	5-2 Day		✓			1	1
TB-NHP01	NP	✓	✓	✓		2	1
TB-NAC01	NP		✓			1	1
THERMOSTAT ACCESSORIES							
PART NUMBER	BRIEF DESCRIPTION				THERMOSTATS USED WITH		
SYSTXCCRRS01	Indoor Remote Room Temperature Sensor				All TP - thermostats		
TP-EXP01-A	Exp[] Computer Programming Accessory				TP-P thermostats		
TSTATXXCNV10†	Thermostat Conversion Kit (4 to 5 wire) - 10 pack				All Carrier[] branded thermostats		
TX-LBP01	Large Decorative Backplate				TP-Pxx, TP-Nxx, TC-Pxx		
TX-MBP01	Medium Decorative Backplate				TC-Nxx, TB-Pxx		
TX-SBP01	Small Decorative Backplate				TB-Nxx		
TSTATXXSEN01-B*	Outdoor Air Temperature Sensor				All TP - thermostats		

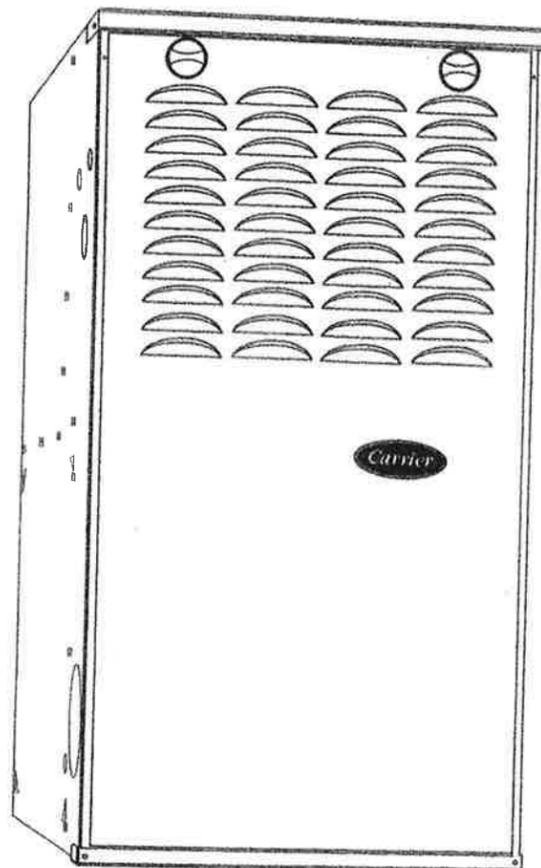
ACCESSORIES

KIT NUMBER	DESCRIPTION	Unit Sizes - Series									
		18-A	24-A	30-A	36-A	42-A	48-A	49-A	60-A	61-A	
KAAFT0101AAA	FREEZE THERMOSTAT	X	X	X	X	X	X	X	X	X	
KAATD0101TDR	TIME DELAY RELAY	X	X	X	X	X	X	X	X	X	
KSALAO301410	LOW AMBIENT PSW	X	X	X	X	X	X	X	X	X	
KSALAO601AAA†	MOTORMASTER 230V	X	X	X	X	X	X	X	X	X	
HC32GE234	MOTOR FAN BALL BEARING	X									
HC34GE240	MOTOR FAN BALL BEARING		X	X							
HC32GE229	MOTOR FAN BALL BEARING										
HC38GE228	MOTOR FAN BALL BEARING				X						
HC40GE228	MOTOR FAN BALL BEARING					X					
KSAS1701AAA	HARD START (CAP / RELAY)	X	X	X	X	X	X	X	X	X	
KSACY0101AAA	CYCLE PROTECTOR	X	X	X	X	X	X	X	X	X	
KSASF0101AAA	SUPPORT FEET	X	X	X	X	X	X	X	X	X	
KAACS0201PTC	START ASSIST PTC	X	X	X	X	X	X	X	X	X	
KAALS0201LLS	LIQUID LINE SOLENOID	X	X	X	X	X	X	X	X	X	
KAAWS0101AAA	WINTER START	X	X	X	X	X	X	X	X	X	
KAACH1701AAA	CRANKCASE HTR	X	X	X	X			X	X	X	
KAACH1601AAA	CRANKCASE HTR										
KSATX0201PUR	TXV PURON HSO	X	X	X			X	S	S	S	
KSATX0301PUR	TXV PURON HSO					X					
KSATX0401PUR	TXV PURON HSO						X				
KSATX0501PUR	TXV PURON HSO							X			
KSASH0601COP	SOUND HOOD	X	X	X	X			X	X	X	
KSASH2101COP	SOUND HOOD						X	X	X	X	
KAALP0401PUR	LOW PRESSURE SWITCH	X	X	X	X	X	X	X	X	X	
KAALH0501PUR	HIGH PRESSURE SWITCH	X	X	X	X	X	X	X	X	X	

† Required accessories include ball bearing fan motor, compressor start assist (CAP / Relay), crankcase heater, evaporator freeze stat, hard shut-off TXV.
X = Accessory / S - Standard



Product Data



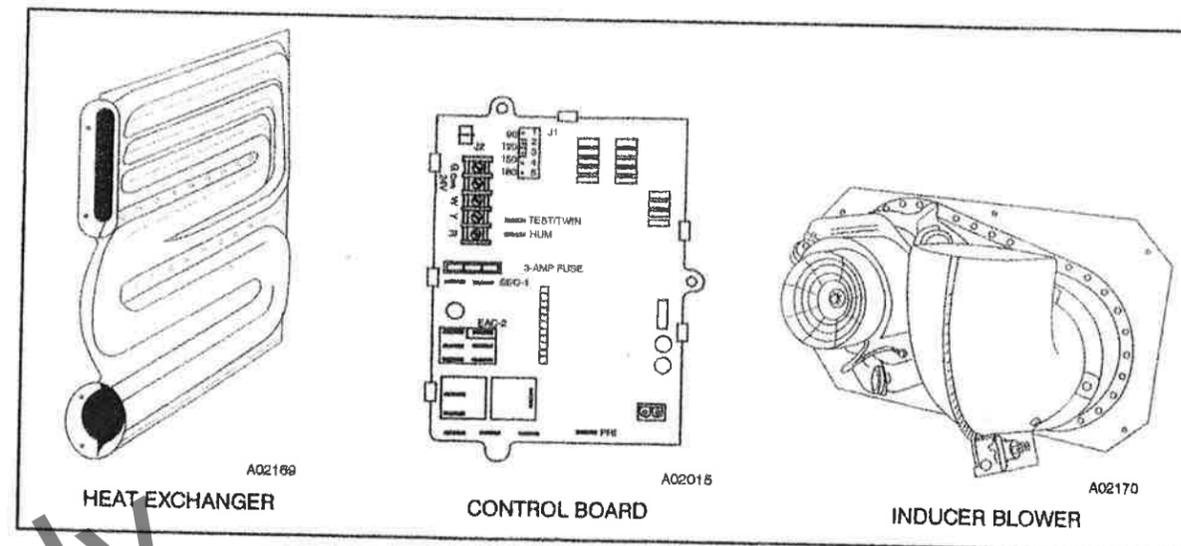
A10247

THE CARRIER 58STA/STX GAS FURNACE

The 58STA/STX 4-way Multipoise Gas Furnaces feature Carrier's QuietTech™ noise reduction system for incredibly quiet induced draft operation. Applications are easy with 4-way multipoise design, through-the-furnace downflow venting, 13 different venting options, and designed for easy service access. An inner blower door is provided for tighter sealing in sensitive applications. The 58STA/STX furnaces are approved for use with natural or propane gas, and the 58STX is approved for use in Low NOx Air Management Districts.

STANDARD FEATURES

- QuietTech™ noise reduction system
- Microprocessor based control center
 - Enhanced diagnostics with LED and reflective sight glass.
 - Stores fault codes during power outages.
 - Adjustable heating air temperature rise
 - Adjustable cooling airflow
- 4-way Multipoise furnace, 13 vent applications
- Compact design - only 33-1/3 in. (847 mm) tall
- Power Heat™ Igniter
- Draft safeguard switch to ensure proper furnace venting
- Inner door for tighter sealing
- Certified to leak 2 percent or less of its nominal air conditioning CFM delivered when pressurized to 1-In. Water Gauge with all present air inlets, air outlets, and condensate drain port(s) sealed.
- HYBRID HEAT® Dual Fuel System compatible
- All models are chimney friendly when used with accessory vent kit
- Twinning in Upflow, Downflow and Horizontal
- Residential installations eligible for consumer financing through the Retail Credit Program

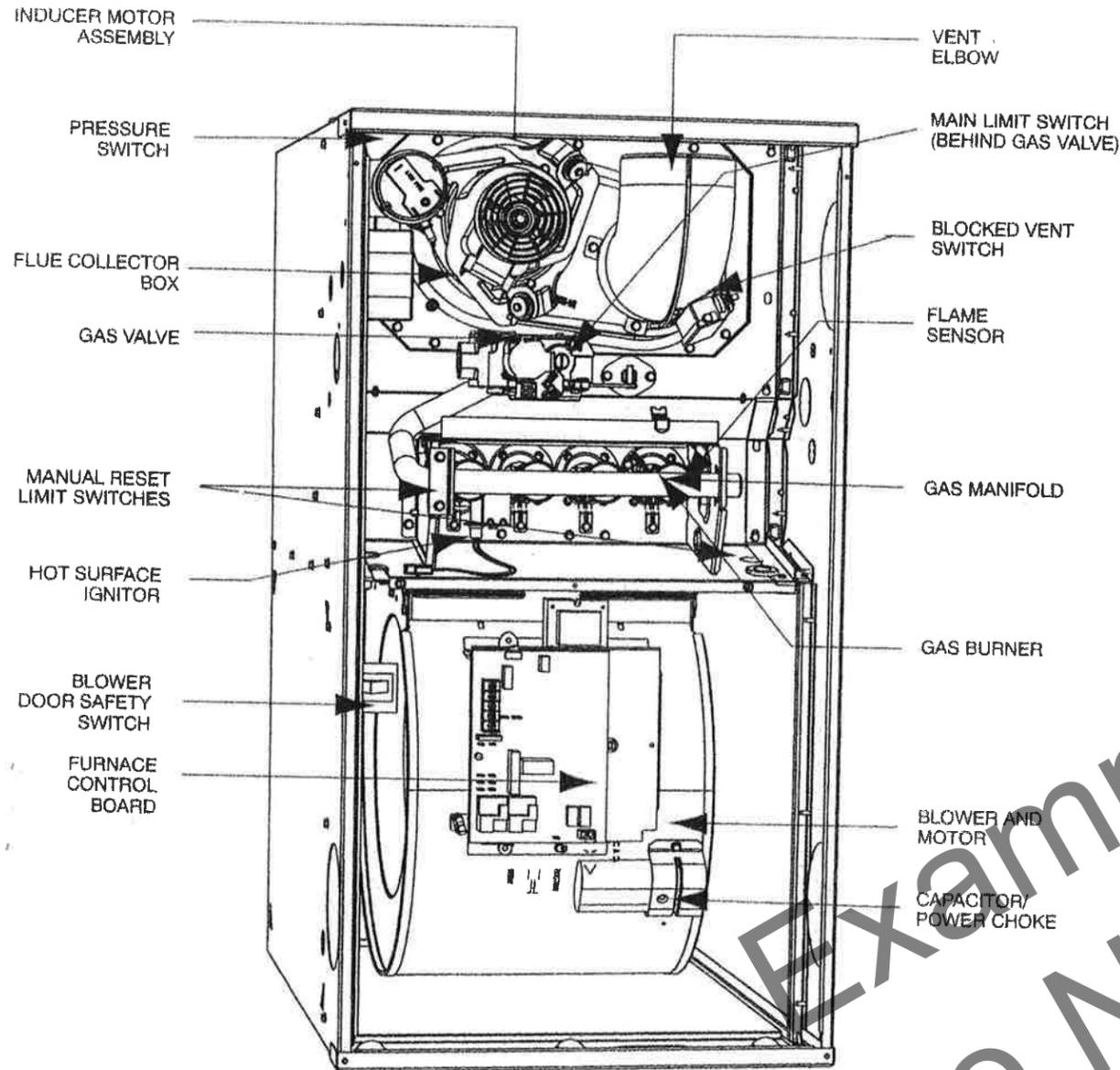


58STA/STX

MODEL NUMBER NOMENCLATURE

	58STA	045	100	08
58STA 4-Way Multipoise 58STX Low NOx version				
Input Capacity	045-44,000 Btuh	110-110,000 Btuh	070-68,000 Btuh	135-132,000 Btuh
	090-88,000 Btuh	155-154,000 Btuh		
Series Number			100 110 120 130 140	Nominal Cooling Size (Airflow at .5 e.s.p.) (400 CFM per 12,000 Btuh) 08-800 CFM 12-1200 CFM 14-1400 CFM 16-1600 CFM 20-2000 CFM 22-2200 CFM

FURNACE COMPONENTS



58STA STX

A10308

NOTE: The 58STA/STX Furnaces are factory shipped for use with natural gas. These furnaces can be field-converted for propane gas with a factory-authorized and listed accessory conversion kit.

CARRIER ACCESSORIES

A97432

CONTROLS: THERMOSTATS AND ZONING

Available in programmable and non-programmable models, Carrier thermostats maintain a constant temperature level in the home. For the ultimate in home comfort, Carrier's 2, 4, and 8-zone systems allow temperature control of individual "zones" of the home. This is accomplished through a series of electronic dampers and remote room sensors. The 4-zone system is shown.

A02121

EXTERNAL FILTER RACK (SIDE OR BOTTOM)

Custom-made filter rack for easy connection when a return plenum already exists. Provides easy access for cleaning filter.

A04008

MECHANICAL OR ELECTRONIC AIR CLEANER

Cleans the air of smoke, dirt, and many pollens commonly found. Saves decorating and cleaning expenses by keeping carpets, furniture, and drapes cleaner. Electronic air cleaner is shown.

A01484

MODEL HUMCCLFP HUMIDIFIER

By adding moisture to winter-dry air, a Carrier humidifier can often improve comfort and keep furniture, rugs, and draperies in better condition. Moisturizing household air also helps to retain normal body heat and provides comfort at lower temperatures.

Accessories	
ELECTRONIC AIR CLEANER (EAC)	Model EACB
MECHANICAL AIR CLEANER HUMIDIFIER	Models EZXCAB, FILCAB
HEAT RECOVERY VENTILATOR	Model HUM
ENERGY RECOVERY VENTILATOR	Model HRV
UV LIGHTS	Model ERV
	Model UVL
THERMOSTAT - NON-PROGRAMMABLE	For use with 1-speed Air Conditioner - deg. F/C, Auto Changeover - TP-NAC, TC-NAC
	For use with 1-speed Heat Pump - deg. F/C, Auto Changeover - TP-NHP, TC-NHP*
	For use with 2-speed Air Conditioner - deg. F/C, Auto Changeover - TP-NRH*
	For use with multi-use / stage configurations - deg. F/C, Auto Changeover/Temperature and Humidity Control - TP-PRH†
THERMOSTAT - PROGRAMMABLE	For use with 1-speed Air Conditioner - deg. F/C, Auto Changeover, 7-Day Programmable - TP-PAC
	For use with 1-speed Heat Pump - deg. F/C, Auto Changeover, 7-Day Programmable - TP-PHP*
	For use with 2-speed Air Conditioner - deg. F/C, Auto Changeover, 7-Day Programmable - TP-PRH*
	For use with 1-speed Air Conditioner - deg. F/C, 5-2 Day Programmable - TP-PAC
	For use with multi-stage applications - deg. F/C, Auto Changeover, 7-Day Programmable - TC-PHP‡
	For multi-use / stage configurations - deg. F/C, Auto Changeover, 7-Day Programmable/Temperature and Humidity Control - TP-PRH†
ZONING CONTROL	Comfort™ Series 3-Zone Kit - ZONECC3ZAC01, ZONECC3ZHP01
	2 Performance™ Series ComfortZone™ II Zoning/Temperature and Humidity Control - ZONECC2KIT01-B
	4 Performance™ Series ComfortZone™ II Zoning/Temperature and Humidity Control - ZONECC4KIT01-B
	8 Performance™ Series ComfortZone™ II Zoning/Temperature and Humidity Control - ZONECC8KIT01-B

* Model HP and 2S thermostat must be field converted to air conditioner operation.
 † Thermidstat Control can be configured for multiple use and staging, it must be configured for each specific application.
 ‡ Dual Fuel thermostat is used with furnace and heat pump application.

CARRIER ACCESSORIES

DESCRIPTION 58STA/STX	PART NO.	045-08	045-12	070-08	070-12	070-16	090-14	090-16	090-20	110-12	110-16	110-22	135-16	135-22	155-20
Media Filter Cabinet	FILCABCC0016	X	X	X	X	X	X			X					
	FILCABCC0020							X	X		X	X	X		
	FILCABCC0024													X	X
Cartridge Media Filter	FILCCAR0016	X	X	X	X	X	X			X					
	FILCCAR0020							X	X		X	X	X		
	FILCCAR0024													X	X
EZ Flex Media Filter with End Caps	EXPXXUNV0016	X	X	X	X	X	X			X					
	EXPXXUNV0020							X	X		X	X	X		
	EXPXXUNV0024													X	X
Replacement EZ Flex Filter Media	EXPXXFIL0016	X	X	X	X	X	X			X					
	EXPXXFIL0020							X	X		X	X	X		
	EXPXXFIL0024													X	X
External Bottom Return Filter Rack	KGAFR0401B14	X	X	X	X										
	KGAFR0501B17					X	X			X					
	KGAFR0601B21							X	X		X	X	X		
	KGAFR0701B24													X	X
External Side Return Filter Rack	KGAFR0801SRE	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Unframed Filter 3/4-in. (19 mm)	KGAWF1301UFR†	X	X	X	X	X	X			X					
	KGAWF1401UFR							X	X		X	X	X		
	KGAWF1501UFR													X	X
	KGAWF1306UFR†	X	X	X	X	X	X			X					
	KGAWF1406UFR							X	X		X	X	X		
	KGAWF1506UFR													X	X
Flue Extension	KGAFE0112UPH	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Twinning Kit	KGATW0601HSI	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Combustible Floor Base	KGASB0201ALL	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Downflow Vent Guard	KGAVG0101DFG	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vent Extension Kit	KGAVE0101DNH	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chimney Adapter Kit	KGACA02014FC	X	X	X	X	X	X	X	X	X	X	X		X	X
	KGACA02015FC													X	X
Natural-to-Propane Conversion Kit*	KGANP4601ALL	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Propane-to-Natural Conversion Kit	KGAPN3901ALL	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Label Kit	KGALB0101KIT	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gas Orifice Kit (Qty 50)	KGAAH0150N42														
	KGAAH0250N43 (factory supplied)														
	KGAAH0350N44														
	KGAAH0450N45														
	KGAAH0550N46														
	KGAAH1550N47														
	KGAAH1850N48														
	KGAAH0650P54														
	KGAAH0750P55														
	KGAAH5750125														
KGAAH5750130															
KGAAH0850P56															

58STA/STX

See Installation Instructions for model, altitude, and heat value usages.

* Factory-authorized and field installed. Fuel conversion kits are CSA (formerly AGA/CGA) recognized.
 † Suitable for Side Return Filter Rack
 X = Accessory
 S = Standard

PHYSICAL DATA

UNIT SIZE	045		070			090		
	08	12	08	12	16	14	16	
OUTPUT CAPACITY BTUH* (Nonweatherized ICS) †	58STX Upflow; all 58STA		35,000	36,000	53,000	54,000	53,000	71,000
	58STX Downflow/Horizontal		34,000	34,000	51,000	51,000	51,000	68,000
INPUT BTUH*	58STX Upflow; all 58STA		44,000	44,000	66,000	66,000	66,000	88,000
	58STX Downflow/Horizontal		42,000	42,000	63,000	63,000	63,000	84,000
AFUE%*	Nonweatherized ICS		80.0	80.0	80.0	80.0	80.0	80.0
SHIPPING WEIGHT - LB (KG)			107 (49)	107 (49)	111 (50)	115 (52)	126 (57)	127 (58)
CERTIFIED TEMP RISE RANGE ° F (° C)			30-80 (17-33)	20-50 (11-28)	40-70 (22-39)	30-60 (17-33)	25-55 (14-30)	40-70 (22-39)
								30-60 (17-33)
CERTIFIED EXT STATIC PRESSURE	Heating		0.10	0.10	0.12	0.12	0.12	0.15
	Cooling		0.50	0.50	0.50	0.50	0.50	0.50
AIRFLOW CFM‡	Heating		920	1250	720	1195	1450	1375
	Cooling		845	1160	900	1200	1530	1385
LIMIT CONTROL	SPST							
HEATING BLOWER CONTROL	Solid-State Time Operation							
BURNERS (Monoport)	2	2	3	3	3	4	4	
GAS CONNECTION SIZE	1/2-in. NPT							
GAS VALVE (Redundant) Manufacturer	White-Rodgers							
Minimum Inlet Pressure (In. W.C.)	4.5 (Natural Gas)							
Maximum Inlet Pressure (In. W.C.)	13.6 (Natural Gas)							
IGNITION DEVICE	Hot Surface							

58STA/STX

* Gas input ratings are certified for elevations to 2000 ft. (610 M). In U.S., for elevations above 2000 ft. (605 M), reduce ratings 4 percent for each 1000 ft. (305 M) above sea level. Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1-2009 F.4 or furnace Installation Instructions.
 † Capacity in accordance with U.S. Government DOE test procedures.
 ‡ Airflow shown is for bottom only return-air supply. For air delivery above 1800 CFM, see Air Delivery Table for other options. A filter is required for each return-air supply.
 ICS - Isolated Combustion System

BLOWER PERFORMANCE DATA

UNIT SIZE	045		070			090	
	08	12	08	12	16	14	16
DIRECT-DRIVE MOTOR Hp (PSC)	1/5	1/3	1/5	1/3	1/2	1/3	1/2
MOTOR FULL LOAD AMPS	2.9	5.2	2.9	5.2	7.9	5.2	7.9
RPM (Nominal)	1075-3	1075-3	1075-3	1075-3	1075-3	1075-3	1075-3
BLOWER WHEEL DIAMETER X WIDTHS - IN. (mm)	10 x 6 (254 x 152)	11 x 8 (279 x 203)	10 x 8 (254 x 203)	10 x 10 (254 x 254)			

PHYSICAL DATA

UNIT SIZE	090		110				135		155
	20	12	16	22	16	22	20		
OUTPUT CAPACITY BTUH* (Nonweatherized ICS) †	58STX Upflow; all 58STA	71,000	89,000	89,000	89,000	107,000	107,000	125,000	
	58STX Downflow/Horizontal	88,000	85,000	85,000	85,000	102,000	102,000	119,000	
INPUT BTUH*	58STX Upflow; all 58STA	88,000	110,000	110,000	110,000	132,000	132,000	154,000	
	58STX Downflow/Horizontal	84,000	105,000	105,000	105,000	126,000	126,000	147,000	
AFUE%*	Nonweatherized ICS								
		80.0	80.0	80.0	80.0	80.0	80.0	80.0	
SHIPPING WEIGHT - LB. (KG)		146 (66)	135 (61)	146 (66)	152 (69)	149 (68)	163 (74)	170 (77)	
CERTIFIED TEMP RISE RANGE - °F (°C)		25-55 (14-30)	50-80 (29-44)	40-70 (22-39)	30-60 (17-33)	50-80 (28-44)	40-70 (22-39)	45-75 (25-41)	
CERTIFIED EXT STATIC PRESSURE	Heating	0.15	0.20	0.20	0.20	0.20	0.20	0.20	
	Cooling	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
AIRFLOW CFM‡	Heating	1990	1335	1515	1900	1525	1850	1790	
	Cooling	2025	1355	1680	2220	1710	2110	2230	
LIMIT CONTROL	SPST								
HEATING BLOWER CONTROL	Solid-State Time Operation								
BURNERS (Monoport)	4	5	5	6	6	6	7		
GAS CONNECTION SIZE	1/2-in. NPT								
GAS VALVE (Redundant) Manufacturer	White-Rodgers								
Minimum Inlet Pressure (In. W.C.)	4.5 (Natural Gas)								
Maximum Inlet Pressure (In. W.C.)	13.6 (Natural Gas)								
IGNITION DEVICE	Hot Surface								

* Gas input ratings are certified for elevations to 2000 ft. (610 M). In U.S., for elevations above 2000 ft. (610 M), reduce ratings 4 percent for each 1000 ft. (305 M) above sea level. Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1-2009 F.4 or furnace installation instructions.

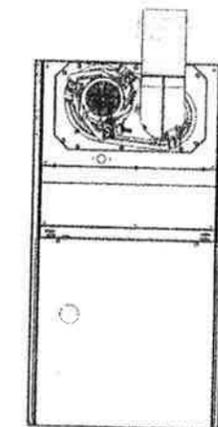
† Capacity in accordance with U.S. Government DOE test procedures.

‡ Airflow shown is for bottom only return-air supply. For air delivery above 1800 CFM, see Air Delivery Table for other options. A filter is required for each return-air supply. An airflow reduction of up to 7 percent may occur when using a Carrier 4-5/16 In. (110 mm) high efficiency media filter.

ICS --- Isolated Combustion System

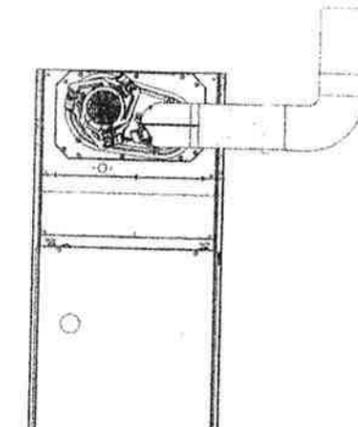
58STA STX

58STA STX



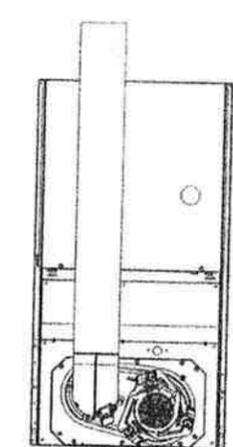
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UPFLOW

A02058



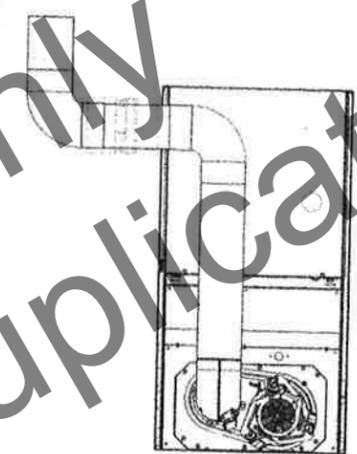
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UPFLOW

A02059



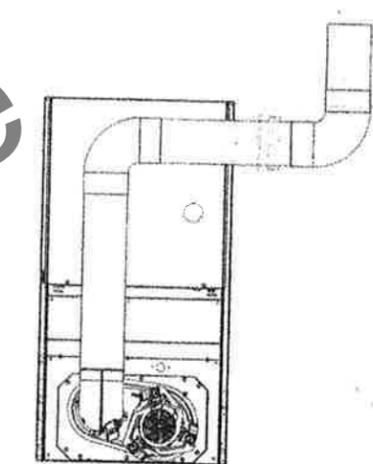
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DOWNFLOW

A02061



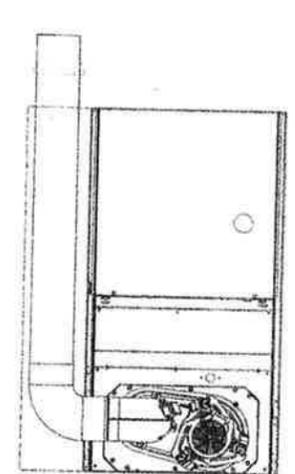
SEE NOTES: 1,2,3,4,5,7,8,9
DOWNFLOW

A02060



SEE NOTES: 1,2,3,4,5,7,8,9
DOWNFLOW

A02063



SEE NOTES: 1,2,4,5,6,7,8,9
DOWNFLOW

A02062

BLOWER PERFORMANCE DATA

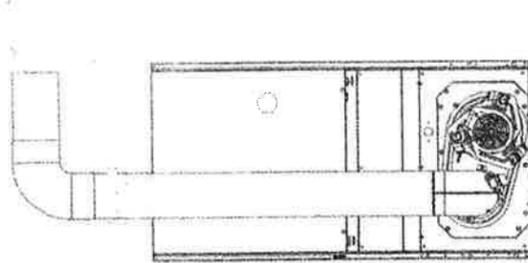
UNIT SIZE	090		110				135		155
	20	12	16	22	16	22	20		
DIRECT-DRIVE MOTOR Hp (PSC)	3/4	1/3	1/2	3/4	1/2	3/4	3/4		
MOTOR FULL LOAD AMPS	11.1	5.2	7.9	11.1	7.9	11.1	11.1		
RPM (Nominal) - Speeds	1075-3	1075-3	1075-3	1075-3	1075-3	1075-3	1075-3		
BLOWER WHEEL DIAMETER X WIDTHS - IN. (mm)	11 x 11 (279 x 279)	10 x 8 (254 x 203)	10 x 10 (254 x 254)	11 x 11 (279 x 279)	10 x 10 (254 x 254)	11 x 11 (279 x 279)	11 x 11 (279 x 279)		

PSC-Permanent Split Capacitor

Example Only
 Do Not Duplicate

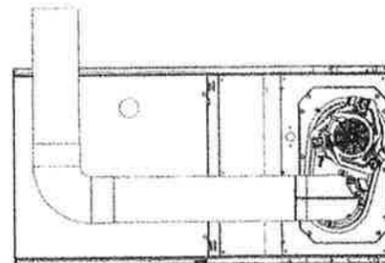
Venting Notes

- For common vent, vent connector sizing and vent material: United States, latest edition of the National Fuel Gas Code (NFPA), ANSI Z223.1/NFPA 54.
- Immediately increase to 5-in. (127 mm) vent connector outside furnace casing when 5-in. (127 mm) vent connector required, refer to Note 1.
- Side outlet vent for upflow and downflow installations must use Type B vent immediately after exiting the furnace, except when Downflow Vent Guard is used in downflow position.
- Type B vent where required, refer to Note 1.
- 4-in. (102 mm) single wall vent must be used inside furnace casing and the Downflow Vent Guard Kit.
- Accessory Downflow Vent Guard Kit required in downflow installations with bottom vent configuration.
- Chimney Adapter Kit required for exterior masonry chimney applications. Refer to Chimney Adapter Kits for sizing and complete application details.
- Secure vent connector to furnace elbow with (2) corrosion-resistant sheet metal screws, space approximately 180° apart.
- Secure all other single wall vent connector joints with (3) corrosion-resistant screws spaced approximately 120° apart. Secure Type B vent connectors per vent connector manufacturer's recommendations.



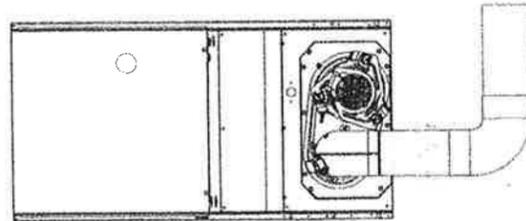
SEE NOTES 1,2,4,5,7,8,9
HORIZONTAL RIGHT

A02068



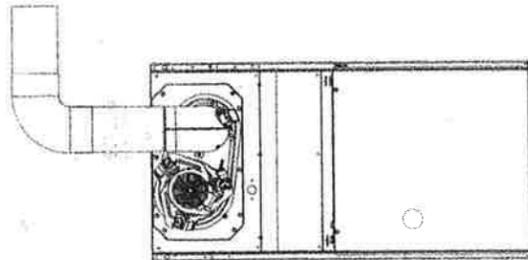
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A02070



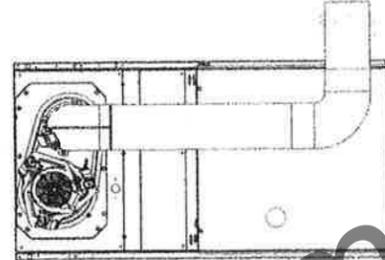
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A02069



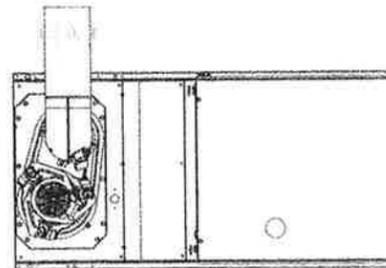
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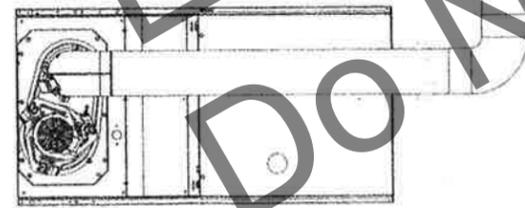
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A02065



SEE NOTES 1,2,4,5,7,8,9
HORIZONTAL LEFT

A02066



SEE NOTES 1,2,4,5,7,8,9
HORIZONTAL LEFT

A02067

585 STA STX

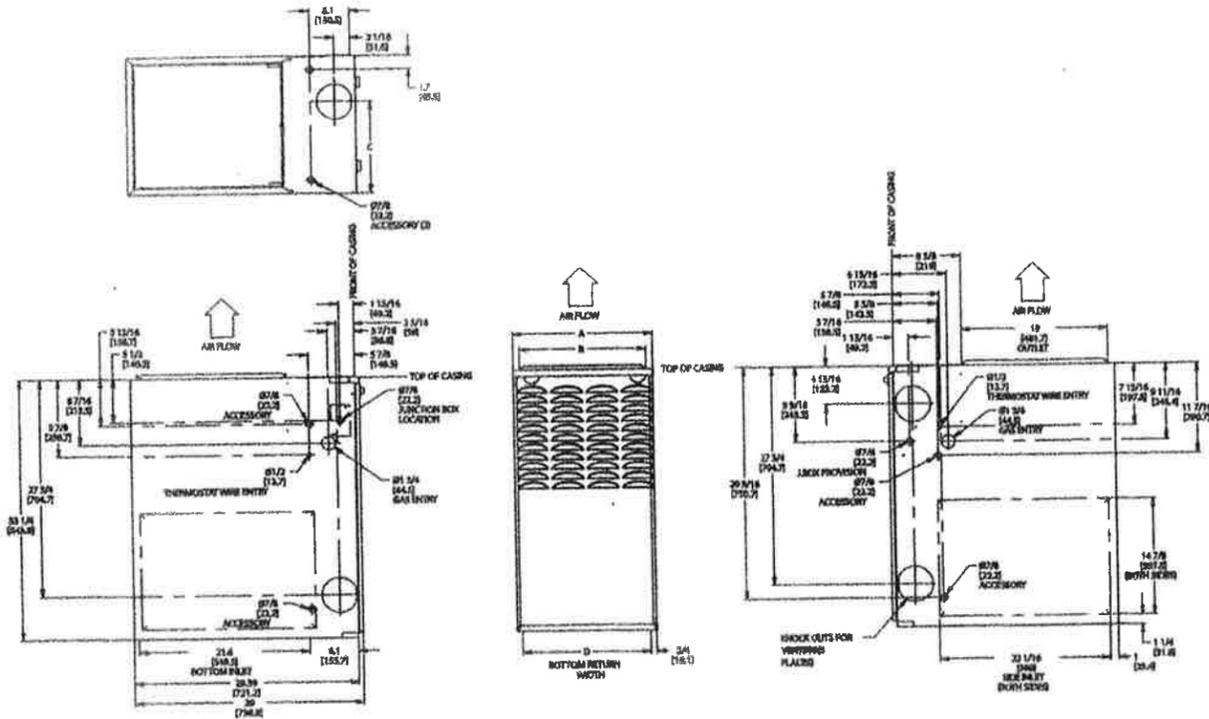
585 STA STX

AIR DELIVERY - CFM (With Filter)

UNIT SIZE	RETURN-AIR SUPPLY	SPEED	EXTERNAL STATIC PRESSURE (In. W.C.)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
045-06	Bottom or Side(s)	High	1085	1035	975	915	845	770	675	565	390	195
		Med-High	920	875	830	770	710	640	555	440	250	—
		Med-Low	820	775	730	680	620	555	470	380	190	—
045-12	Bottom or Side(s) Low	High	1450	1375	1305	1225	1145	1050	955	845	705	510
		Med-High	1360	1300	1240	1175	1115	1040	950	850	725	575
		Med-Low	1250	1210	1180	1100	1040	965	885	790	670	520
070-08	Bottom or Side(s)	High	1030	1010	980	945	900	845	775	680	490	335
		Med-High	835	815	790	760	720	675	610	490	375	285
		Med-Low	725	700	675	645	600	555	475	390	300	—
070-12	Bottom or Side(s)	High	1425	1375	1320	1265	1200	1125	1035	940	830	655
		Med-High	1320	1280	1240	1205	1140	1075	995	905	790	620
		Med-Low	1200	1175	1145	1105	1050	990	920	840	725	555
070-16	Bottom or Side(s)	High	1805	1740	1670	1600	1530	1445	1360	1280	1180	1075
		Med-High	1630	1585	1530	1470	1405	1330	1255	1170	1080	990
		Med-Low	1460	1420	1385	1325	1260	1220	1155	1080	995	910
090-14	Bottom or Side(s)	High	1650	1600	1535	1465	1385	1285	1175	1055	895	645
		Med-High	1515	1485	1440	1380	1300	1220	1115	990	830	600
		Med-Low	1385	1360	1320	1260	1195	1120	1025	915	710	585
090-16	Bottom or Side(s)	High	2060	1985	1915	1820	1720	1610	1490	1340	1135	925
		Med-High	1790	1765	1715	1645	1560	1470	1345	1195	1010	820
		Med-Low	1505	1505	1480	1440	1375	1300	1190	1045	890	740
090-20	Bottom Only	High	2405	2310	2220	2130	2025	1920	1790	1660	1530	1350
		Med-High	2225	2155	2060	1965	1895	1785	1675	1555	1420	1260
		Med-Low	2020	1965	1880	1805	1730	1630	1535	1420	1275	1135
090-20	Both Sides or 1 Side & Bottom	High	2830	2460	2365	2270	2165	2065	1940	1805	1670	1505
		Med-High	2285	2215	2150	2075	1985	1890	1780	1660	1525	1360
		Med-Low	1995	1945	1900	1840	1770	1685	1600	1480	1350	1180
090-20	1 Side Only	High	2475	2395	2300	2200	2090	1985	1865	1730	1585	1425
		Med-High	2260	2190	2110	2035	1940	1845	1735	1620	1475	1325
		Med-Low	1950	1910	1855	1795	1730	1650	1555	1445	1310	1150
110-12	Bottom or 1 Side(s)	High	1625	1575	1515	1445	1355	1260	1165	1070	980	785
		Med-High	1510	1470	1415	1355	1285	1185	1070	980	725	—
		Med-Low	1360	1335	1295	1250	1180	1100	985	810	—	—
110-16	Bottom or 1 Side	High	2035	1965	1880	1790	1680	1495	1365	1215	1075	875
		Med-High	1745	1710	1650	1580	1490	1340	1205	1090	955	750
		Med-Low	1530	1515	1470	1400	1310	1215	1095	980	830	670
110-22	Bottom Only	High	2530	2470	2400	2320	2220	2115	2000	1865	1730	1590
		Med-High	2230	2205	2165	2110	2035	1950	1855	1740	1615	1485
		Med-Low	1920	1900	1880	1845	1795	1730	1650	1555	1460	1340
110-22	Both Sides or 1 Side & Bottom	High	—	—	2415	2360	2280	2145	2015	1875	1715	1580
		Med-High	2235	2200	2155	2100	2040	1955	1850	1740	1695	1470
		Med-Low	2540	2495	2430	2355	2265	2175	2065	1935	1785	1650
110-22	1 Side Only	High	2125	2120	2105	2060	2010	1940	1840	1730	1615	1485
		Med-High	1790	1795	1790	1765	1720	1650	1565	1500	1390	1280
		Med-Low	2090	2010	1930	1835	1710	1590	1470	1335	1205	1025
135-16	Bottom or 1 Side	High	2090	2010	1930	1835	1710	1590	1470	1335	1205	1025
		Med-High	1790	1755	1705	1640	1550	1465	1360	1210	1045	785
		Med-Low	1545	1525	1500	1450	1380	1315	1215	1005	855	670
135-22	Bottom Only	High	2485	2400	2310	2215	2110	2000	1880	1725	1535	1355
		Med-High	2195	2150	2090	2000	1920	1825	1720	1585	1405	1255
		Med-Low	1880	1850	1820	1780	1715	1635	1540	1415	1280	1160
135-22	Both Sides or 1 Side & Bottom	High	—	—	2385	2305	2195	2065	1960	1825	1670	1485
		Med-High	2180	2145	2060	2010	1945	1865	1765	1660	1515	1325
		Med-Low	—	—	2245	2155	2085	1940	1825	1695	1555	1385
135-22	1 Side Only	High	2135	2085	2035	1975	1895	1795	1685	1565	1445	1285
		Med-High	1880	1850	1820	1780	1715	1635	1540	1415	1290	1160
		Med-Low	2485	2430	2375	2305	2230	2110	2000	1885	1725	1545
155-20	Bottom Only	High	2115	2105	2075	2030	1980	1910	1830	1725	1590	1425
		Med-High	1800	1790	1770	1735	1695	1640	1570	1485	1345	1225
		Med-Low	—	—	2375	2285	2200	2105	1995	1870	1730	1570
155-20	Both Sides or 1 Side & Bottom	High	2155	2135	2095	2040	1975	1895	1790	1685	1550	1400
		Med-High	—	—	2260	2180	2085	1975	1865	1740	1605	1455
		Med-Low	2140	2095	2040	1975	1895	1810	1705	1595	1480	1325
155-20	1 Side Only	High	1800	1790	1770	1735	1695	1640	1570	1485	1345	1225
		Med-High	—	—	2200	2180	2085	1975	1865	1740	1605	1455
		Med-Low	—	—	2200	2180	2085	1975	1865	1740	1605	1455

* A filter is required for each return-air supply. Airflow performance includes 3/4-in. (19 mm) washable filter media such as contained in factory-authorized accessory filter rack. To determine airflow performance without this filter, assume an additional .1 available external static pressure.
 — Indicates unstable operating conditions.

DIMENSIONS



A10270

- NOTES:**
- Two additional 7/8-in. (22 mm) diameter holes are located in the top plate.
 - Minimum return-air openings at furnace, based on metal duct. If flex duct is used, see flex duct manufacturer's recommendations for equivalent diameters.
 - For 800 CFM—16-in. (406 mm) round or 14 1/2 x 12-in. (368 x 305 mm) rectangle.
 - For 1200 CFM—20-in. (508 mm) round or 14 1/2 x 19 1/2-in. (368 x 495 mm) rectangle.
 - For 1600 CFM—22-in. (559 mm) round or 14 1/2 x 22 1/16-in. (368 x 560mm) rectangle.
 - For airflow requirements above 1800 CFM, see Air Delivery table in Product Data literature for specific use of single side inlets. The use of both side inlets, a combination of 1 side and the bottom, or the bottom only will ensure adequate return air openings for airflow requirements above 1800 CFM.

FURNACE SIZE	A CABINET WIDTH IN (mm)	B OUTLET WIDTH IN (mm)	C TOP AND BOTTOM FLUE COLLAR	D BOTTOM INLET WIDTH	VENT CONNECTION SIZE	SHIP WEIGHT LB (KG)
045-08	14-3/16 (360)	12-9/16 (319)	9-5/16 (237)	12-11/16 (322)	4 (102)	104 (47)
045-12	14-3/16 (360)	12-9/16 (319)	9-5/16 (237)	12-11/16 (322)	4 (102)	107 (49)
070-08	14-3/16 (360)	12-9/16 (319)	9-5/16 (237)	12-11/16 (322)	4 (102)	111 (50)
070-12	14-3/16 (360)	12-9/16 (319)	9-5/16 (237)	12-11/16 (322)	4 (102)	115 (52)
070-16	17-1/2 (445)	15-7/8 (403)	11-9/16 (294)	16-1/8 (410)	4 (102)	126 (57)
090-14	17-1/2 (445)	15-7/8 (403)	11-9/16 (294)	16-1/8 (410)	4 (102)	127 (58)
090-16	21 (533)	19-3/8 (492)	13-5/16 (338)	19-1/2 (495)	4 (102)	140 (64)
090-20	21 (533)	19-3/8 (492)	13-5/16 (338)	19-1/2 (495)	4 (102)	146 (66)
110-12	17-1/2 (445)	15-7/8 (403)	11-9/16 (294)	16-1/8 (410)	4 (102)	135 (61)
110-16	21 (533)	19-3/8 (492)	13-5/16 (338)	19-1/2 (495)	4 (102)	146 (66)
110-22	21 (533)	19-3/8 (492)	13-5/16 (338)	19-1/2 (495)	4 (102)	152 (69)
135-16	21 (533)	19-3/8 (492)	13-5/16 (338)	19-1/2 (495)	4 (102)*	149 (68)
135-22	24-1/2 (622)	22-7/8 (581)	15-1/16 (383)	23 (584)	4 (102)*	163 (74)
155-20	24-1/2 (622)	22-7/8 (581)	15-1/16 (383)	23 (584)	4 (102)*	170 (77)

*135 and 155 size furnaces require a 5 or 6-in. (127 or 152 mm) vent. Use a vent adapter between furnace and vent stack. See Installation Instructions for complete installation requirements.

WARNING
FIRE EXPLOSION,
ASPHYXIATION HAZARD

Improper adjustment, alteration, service, maintenance, or installation can cause serious injury or death.

Read and follow instructions and precautions in User's Information Manual provided with this furnace. Installation and service must be performed by a qualified service agency or the gas supplier.

CAUTION

Check entire gas assembly for leaks after lighting this appliance.

INSTALLATION

- This furnace must be installed in accordance with the manufacturer's instructions and local codes. In the absence of local codes, follow the National Fuel Gas Code ANSI Z223.1 / NFPA54 or CSA B-149. 1 Gas Installation Code.
- This furnace must be installed so there are provisions for combustion and ventilation air. See manufacturer's installation information provided with this appliance.

OPERATION

This furnace is equipped with manual reset limit switch(es) in burner compartment to protect against overheat conditions that can result from inadequate combustion air supply or blocked vent conditions.

- Do not bypass limit switches.
- If a limit opens, call a qualified serviceman to correct the condition and reset limit switch.

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INSTALLATION

MINIMUM INCHES CLEARANCE TO COMBUSTIBLE CONSTRUCTION

This forced air furnace is equipped for use with natural gas at altitudes 0 - 10,000 ft (0 - 3,050m). An accessory kit, supplied by the manufacturer, shall be used to convert to propane gas use or may be required for some natural gas applications. This furnace is for indoor installation in a building constructed on site. This furnace may be installed on combustible flooring in alcove or closet at minimum clearance as indicated by the diagram from combustible material. This furnace may be used with a Type B-1 Vent and may be vented in common with other gas fired appliances.

This furnace is approved for UPFLOW, DOWNFLOW, and HORIZONTAL installations. Clearance arrows do not change with furnace orientation.

Vent Clearance to combustibles:
For Single Wall vents 6 inches (6 po).
For Type B-1 vent type 1 inch (1 po).

MINIMUM INCHES CLEARANCE TO COMBUSTIBLE CONSTRUCTION

DOWNFLOW POSITIONS:

- † Installation on non-combustible floors only.
- For Installation on combustible flooring only when installed on special base, Part No. KGASB0201ALL or NAHA01101SB, Coil Assembly, Part No. CAR, CAP, CNPV, CNRV, END4X, ENW4X, WENC, WTNW, WENW OR WTNW.
- Ø 18 inches front clearance required for alcove.
- * Indicates supply or return sides when furnace is in the horizontal position. Line contact only permissible between lines formed by intersections of the Top and two Sides of the furnace jacket, and building joists, studs or framing.

336896-101 REV. C

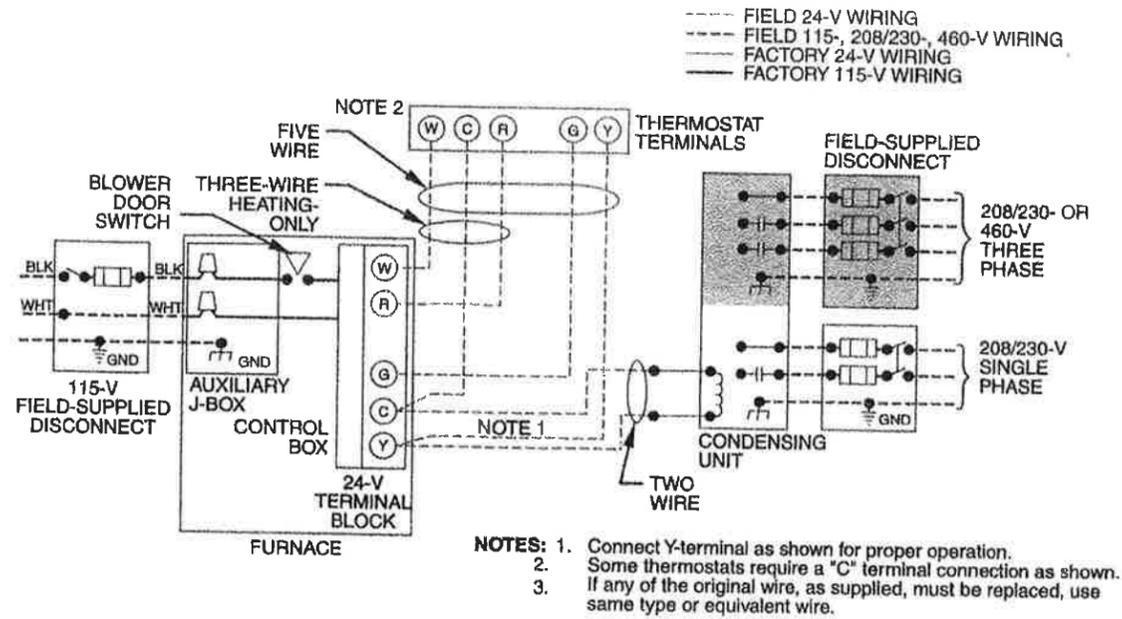
Certified System
ISO 9001
QMI-SAI Global

AHRI CERTIFIED
www.ahridirectory.org

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

DESIGN CERTIFIED
Always Ask For
FACTORY AUTHORIZED PARTS

TYPICAL WIRING SCHEMATIC



A02186

ELECTRICAL DATA

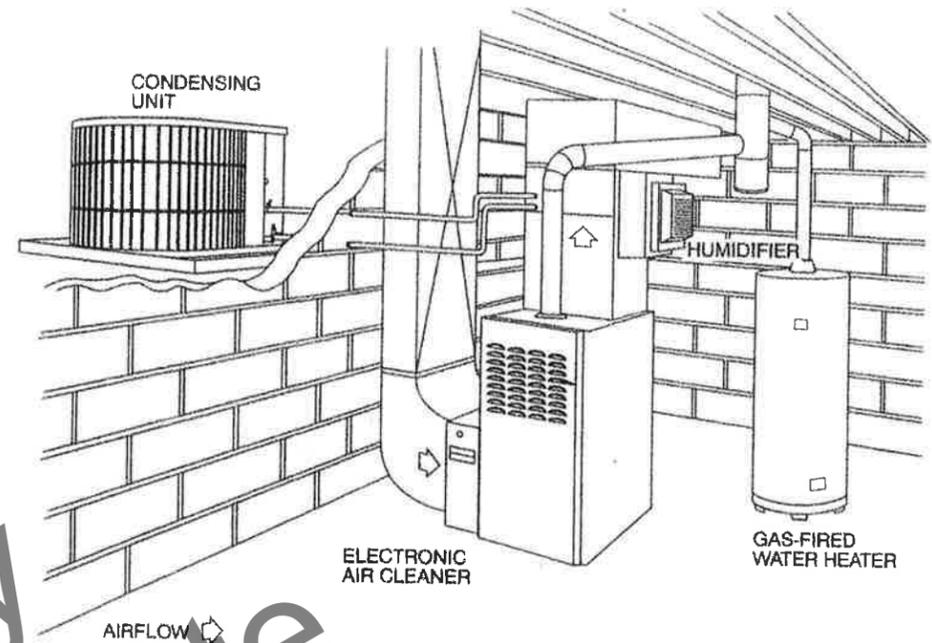
58STA/STX UNIT SIZE	VOLTS HERTZ PHASE	OPERATING VOLTAGE RANGE		MAXIMUM UNIT AMPS	MAXIMUM WIRE LENGTH FT (M)†	MAXIMUM FUSE OR CKT BKR AMPS‡	MINIMUM WIRE GAGE
		Maximum*	Minimum*				
045-08	115-60-1	127	104	5.4	49 (14.9)	15	14
045-12	115-60-1	127	104	7.0	39 (11.8)	15	14
070-08	115-60-1	127	104	5.0	52 (15.8)	15	14
070-12	115-60-1	127	104	6.8	40 (12.1)	15	14
070-16	115-60-1	127	104	9.5	29 (8.8)	15	14
090-14	115-60-1	127	104	8.2	34 (10.3)	15	14
090-16	115-60-1	127	104	10.0	28 (8.5)	15	14
090-20	115-60-1	127	104	13.6	32 (9.7)	20	12
110-12	115-60-1	127	104	8.2	34 (10.3)	15	14
110-16	115-60-1	127	104	10.1	28 (8.5)	15	14
110-22	115-60-1	127	104	14.8	30 (9.1)	20	12
135-16	115-60-1	127	104	10.2	27 (8.2)	15	14
135-22	115-60-1	127	104	14.4	30 (9.1)	20	12
155-20	115-60-1	127	104	15.0	29 (8.8)	20	12

* Permissible limits of the voltage range at which unit operates satisfactorily.

† Time-delay type is recommended.

‡ Length shown is as measured 1 way along wire path between unit and service panel for maximum 2 percent voltage drop.

TYPICAL INSTALLATION



A10211

GUIDE SPECIFICATIONS

Gas Furnace

58STA/STX

General

SYSTEM DESCRIPTION

Furnish a _____ fixed capacity gas-fired furnace for use with natural gas or propane (factory authorized conversion kit required for propane); furnish cold air return plenum.

QUALITY ASSURANCE

Unit will be designed, tested and constructed to the current ANSI Z 21.47/CSA 2.3 design standard for gas-fired central furnaces.

Unit will be 3rd party certified by CSA to the current ANSI Z 21.47/CSA 2.3 design standard for gas-fired central furnaces.

Unit will carry the CSA Blue Star® label.

Unit efficiency testing will be performed per the current DOE test procedure as listed in the Federal Register.

Unit will be certified for capacity and efficiency and listed in the latest AHRI Consumer's Directory of Certified Efficiency Ratings.

Unit shall carry the current Federal Trade Commission Energy Guide efficiency label.

DELIVERY, STORAGE AND HANDLING

Unit shall be shipped as single package only and is stored and handled per unit manufacturer's recommendations.

WARRANTY (for inclusion by specifying engineer)

Warranty certificate available upon request.

Products

EQUIPMENT

Components shall include: slow-opening gas valve to reduce ignition noise, regulate gas flow, with electric switch gas shut-off; flame proving sensor, hot surface igniter, pressure switch assembly, flame rollout switch, blower and inducer assembly, 40va transformer; low-voltage (heating) (heating/cooling) thermostat.

Blower Wheel and Blower Motor

Galvanized blower wheel shall be centrifugal type, statically and dynamically balanced. Blower motor of PSC type shall be permanently lubricated with sealed bearings, of _____ hp, and shall be multiple-speed direct drive. Blower motor shall be soft mounted to the blower scroll to reduce vibration transmission.

Filters

Furnace may have reusable-type filters. Filter shall be _____ in. (mm) (x) _____ in. (mm). An accessory high efficiency Media Filter is available as an option. _____ Media Filter.

Casing

Casing shall be of .030 in. (.76) thickness minimum, pre-painted galvanized steel.

Inducer Motor

Inducer motor shall be soft mounted to reduce vibration transmission.

Draft Safeguard Switch

Draft Safeguard Switch (blocked vent safeguard) shall be factory installed to reduce the possibility of vent gas infiltration due to a blocked or restricted vent pipe.

Heat Exchangers

Heat exchangers shall be a 4-Pass 20 gage aluminized steel of fold-and-crimp sectional design when applied operating under negative pressure.

Controls

Control shall include a micro-processor based integrated electronic control board with at least 11 service troubleshooting codes displayed via enhanced flashing LED diagnostic light on the control, a self-test feature that checks all major functions of the furnace within one minute, and a non-volatile memory replaceable automotive-type circuit protection fuse. Multiple operational settings available including, separate blower speeds for heating, cooling and continuous fan. Continuous fan speed may be adjusted from the thermostat. Cooling airflow will be selectable between 350 or 400 CFM per ton of air conditioning.

OPERATING CHARACTERISTICS

Heating Capacity shall be _____ Btuh input; _____ Btuh output capacity.

Fuel Gas Efficiency shall be 80% AFUE. Air delivery shall be _____ CFM minimum at 0.50 in. W.C. external static pressure.

Dimensions shall be: depth _____ in. (mm); width _____ in. (mm); height _____ in. (mm) (casing only). Height shall be _____ in. (mm) with A/C coil and _____ in. (mm) overall with plenum.

ELECTRICAL REQUIREMENTS

Electrical supply shall be 115 volts, 60 Hz, single-phase (nominal). Minimum wire size shall be _____ AWG; maximum fuse size or circuit breaker shall be _____ Amps.

SPECIAL FEATURES

Refer to section of the product data sheet identifying accessories and descriptions for specific features and available enhancements.

58STA STX

Prescriptive Certificate of Compliance: Residential		CF-1R-ALT
Residential Alterations		(Page 3 of 5)
Project Name: HVAC	Climate Zone # 10	# of Stories 1

ROOFING PRODUCTS (COOL ROOFS) §151(f)12

When the area of exterior roof surface to be replaced exceeds more than 50% of the existing roof area, or more than 1,000 ft², whichever is less, the new roofing area must meet the roofing product "Cool Roof" requirements of §152(b)1Hi, 152(b)1Hii, or 152(b)1Hiii.

Check applicable alternative or exception below if the roof alteration is exempt from the roofing product "Cool Roof" requirements. Note: If any one of the alternatives or exception below is checked, the Aged Solar Reflectance and Thermal Emittance requirements for roofing products in §118(i) are not applicable. Do not fill table below.

Cool Roofs Not Required in Climate Zones 1-12, 14, and 16 with a Low Sloped. Less or 2:12 pitch.

Cool Roofs Not Required in Climate Zones 1 through 9 and 16 with a Steep-Sloped Roofs (pitch greater than 2:12) and product unit weight less than 5lb/ft².

Alternatives to §152(b)1Hi and §152(b)1Hii, Steep-slope roof (pitch > 2:12)

Insulation with a thermal resistance of at least 0.85 hr-ft²-°F/Btu or at least a 3/4 inch air-space is added to the roof deck over an attic; or

Existing ducts in the attic are insulated and sealed according to §151(f)10; or

In climate zones 10, 12 and 13, with 1 ft² of free ventilation area of attic ventilation for every 150 ft² of attic floor area, and where at least 30 percent of the free ventilation area is within 2 feet vertical distance of the roof ridge; or

Building has at least R-30 ceiling insulation; or

Building has radiant barrier in the attic meeting the requirements of §151(f)2; or

Building has no ducts in the attic; or

In climate zones 10, 11, 13 and 14, R-3 or greater roof deck insulation above vented attic.

Exception to §152(b)1Hiii, Low-slope roof (pitch ≤ 2:12)

Building has no ducts in the attic.

Other Exceptions

Roofing area covered by building integrated; photovoltaic panels and solar thermal panels are exempt from the below Cool Roof criteria.

Roof constructions that have thermal mass over the roof membrane with at least 25 lb/ft² is exempt from the below Cool Roof criteria.

Note: If no CRRC-1 label is available, this compliance method cannot be used, use the Performance Approach to show compliance, otherwise, Check the applicable box below if Exempt from the Roofing Products "Cool Roof" Requirement:

CRRC Product ID Number ¹	Roof Slope		Product Weight		Product Type ²	Aged Solar Reflectance ^{3,4}	Thermal Emittance	SRI ⁵
	≤ 2:12	> 2:12	< 5lb/ft ²	≥ 5lb/ft ²				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		

1. The CRRC Product ID Number can be obtained from the Cool Roof Rating Council's Rated Product Directory at www.coolroofs.org/products/search.php

2. Indicate the type of product is being used for the roof top, i.e. single-ply roof, asphalt roof, metal roof, etc.

3. If the Aged Reflectance is not available in the Cool Roof Rating Council's Rated Product Directory then use the Initial Reflectance value from the same directory and use the equation $(0.2 + 0.7(p_{initial} - 0.2))$ to obtain a calculated aged value. Where p is the Initial Solar Reflectance.

4. Check box if the Aged Reflectance is a calculated value using the equation above.

5. Calculate the SRI value by using the SRI- Worksheet at <http://www.energy.ca.gov/title24/> and enter the resulting value in the SRI Column above and attach a copy of the SRI- Worksheet to the CF-1R.

To apply Liquid Field Applied Coatings, the coating must be applied across the entire roof surface and meet the dry mil thickness or coverage recommended by the coatings manufacturer and meet minimum performance requirements listed in §118(i)4. Select the applicable coating:

Aluminum-Pigmented Asphalt Roof Coating Cement-Based Roof Coating Other _____

Prescriptive Certificate of Compliance: Residential		CF-1R-ALT
Residential Alterations		(Page 4 of 5)
Project Name: HVAC	Climate Zone # 10	# of Stories 1

HVAC SYSTEMS - HEATING

Heating Equipment Type and Capacity ^{1,2,3}	Minimum Efficiency (AFUE or HSPF)	Distribution Type and Location ⁴	Duct or Piping Insulation R-Value	Thermostat Type	Configuration (Central, Split, Space, Package or Hydronic)
Carrier Furnace	80	Attic	6.0	Digital 5-2	Central

1. Indicate Heating Type (Central Furnace, Wall Furnace, Heat pump, Boiler, Electric Resistance, etc.)

2. Electric resistance heating is allowed only in Component Package C, or except where electric heating is supplemental (i.e., if total capacity ≤ 2 KW or 7,000 Btu/hr electric heating is controlled by a time-limiting device not exceeding 30 minutes). See §151(b)3 exception.

3. Refer to the HERS Verification section on Page 4 of the CF-1R-ALT Form for additional requirements and check applicable boxes.

4. Indicate Type or Location (Ducts, Hydronic in Floor, Radiators, etc.)

HVAC SYSTEMS - COOLING

Cooling Equipment Type and Capacity ^{1,2}	Minimum Efficiency (SEER/EER or COP)	Distribution Type and Location ³	Duct or Piping Insulation R-Value	Thermostat Type	Configuration (Central, Split, Space, Package or Hydronic)
Carrier A/C	14.0	Attic	6.0	Digital 5-2	Split

1. Indicate Cooling Type (A/C, Heat pump, Evap. Cooling, etc.)

2. Refer to the HERS Verification section on Page 4 of the CF-1R-ALT Form for additional requirements and check applicable boxes.

3. Indicate Type or Location (Ducts, Hydronic in Floor, Radiators, etc.)

WATER HEATING

List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating. Individual dwelling DHW heaters must be gas or propane fired. Hot water pipe insulation from the DHW heater to the kitchen(s) and on all underground hot water pipes is required in all component packages in all climate zones.

Water Heater Type/Fuel Type ¹	Distribution Type (Standard, Recirculating) ²	Number In System	Tank Capacity (gal)	Energy Factor or Thermal Efficiency	External Tank Insulation R-Value ³

1. Indicate Type (Storage Gas, Heat Pump, Instantaneous, etc.)

2. Recirculating systems serving multiple dwelling units shall meet the recirculation requirements of §150(n). The Prescriptive requirements do not allow the installation of a recirculating water heating system for single dwelling units.

3. The external water heating tank and pipes shall be insulated to meet the requirements of §150(j).

SPECIAL FEATURES The enforcement agency should pay special attention to the Special Features specified in this checklist below. These items may require written justification and documentation and special verification.

NEW ROOF ASSEMBLY - Radiant Barrier
The radiant barrier requirement of §151(f)2 does not apply to roof alterations.

Slab Edge (Perimeter) Insulation YES NO
YES: In Climate Zone 16 in Component Packages D, R-7 insulation is required.

Heated Slab Insulation YES NO
YES: Slab edge insulation required for all heated slabs in all Climate Zones. See details in Table 118-A of the standards.

Raised Slab Insulation YES NO
YES: In Climate Zones 1, 2, 11, 13, 14 & 16, R-8 insulation is required; in Climate Zones 12 & 15, R-4 is required under component Package D.

Thermal Mass
To obtain Compliance Credit for the installation of thermal mass, use the Performance Approach.

Mandatory Measures Summary		MF-1R	
Residential		(Page 1 of 3)	
Site Address: [REDACTED] LN. MENIFEE, CA	Enforcement Agency: CITY OF MENIFEE	Date: 03-14-2012	

NOTE: Low-rise residential buildings subject to the Standards must comply with all applicable mandatory measures listed, regardless of the compliance approach used. More stringent energy measures listed on the Certificate of Compliance (CF-1R, CF-1R-ADD, or CF-1R-ALT Form) shall supersede the items marked with an asterisk () below. This Mandatory Measures Summary shall be incorporated into the permit documents and the applicable features shall be considered by all parties as minimum component performance specifications whether they are shown elsewhere in the documents or in this summary. Submit all applicable sections of the MF-1R Form with plans.*

DESCRIPTION
Building Envelope Measures:
§116(a)1: Doors and windows between conditioned and unconditioned spaces are manufactured to limit air leakage.
§116(a)4: Fenestration products (except field-fabricated windows) have a label listing the certified U-Factor, certified Solar Heat Gain Coefficient (SHGC), and infiltration that meets the requirements of §10-111(a).
§117: Exterior doors and windows are weather-stripped; all joints and penetrations are caulked and sealed.
§118(a): Insulation specified or installed meets Standards for Insulating Material. Indicate type and include on CF-6R Form.
§118(i): The thermal emittance and solar reflectance values of the cool roofing material meets the requirements of §118(i) when the installation of a Cool Roof is specified on the CF-1R Form.
*§150(a): Minimum R-19 insulation in wood-frame ceiling or equivalent U-factor.
§150(b): Loose fill insulation shall conform with manufacturer's installed design labeled R-Value.
*§150(c): Minimum R-13 insulation in wood-frame wall or equivalent U-factor.
*§150(d): Minimum R-13 insulation in raised wood-frame floor or equivalent U-factor.
§150(f): Air retarding wrap is tested, labeled, and installed according to ASTM E1677-95(2000) when specified on the CF-1R Form.
§150(g): Mandatory Vapor barrier installed in Climate Zones 14 or 16.
§150(l): Water absorption rate for slab edge insulation material alone without facings is no greater than 0.3%; water vapor permeance rate is no greater than 2.0 perm/inch and shall be protected from physical damage and UV light deterioration.
Fireplaces, Decorative Gas Appliances and Gas Log Measures:
§150(e)1A: Masonry or factory-built fireplaces have a closable metal or glass door covering the entire opening of the firebox.
§150(e)1B: Masonry or factory-built fireplaces have a combustion outside air intake, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight-fitting damper and or a combustion-air control device.
§150(e)2: Continuous burning pilot lights and the use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building, are prohibited.
Space Conditioning, Water Heating and Plumbing System Measures:
§110-§113: HVAC equipment, water heaters, showerheads, faucets and all other regulated appliances are certified by the Energy Commission.
§113(c)5: Water heating recirculation loops serving multiple dwelling units and High-Rise residential occupancies meet the air release valve, backflow prevention, pump isolation valve, and recirculation loop connection requirements of §113(c)5.
§115: Continuously burning pilot lights are prohibited for natural gas: fan-type central furnaces, household cooking appliances (appliances with an electrical supply voltage connection with pilot lights that consume less than 150 Btu/hr are exempt), and pool and spa heaters.
§150(h): Heating and/or cooling loads are calculated in accordance with ASHRAE, SMACNA or ACCA.
§150(i): Heating systems are equipped with thermostats that meet the setback requirements of Section 112(c).
§150(j)1A: Storage gas water heaters rated with an Energy Factor no greater than the federal minimal standard are externally wrapped with insulation having an installed thermal resistance of R-12 or greater.
§150(j)1B: Unfired storage tanks, such as storage tanks or backup tanks for solar water-heating system, or other indirect hot water tanks have R-12 external insulation or R-16 internal insulation where the internal insulation R-value is indicated on the exterior of the tank.
§150(j)2: First 5 feet of hot and cold water pipes closest to water heater tank, non-recirculating systems, and entire length of recirculating sections of hot water pipes are insulated per Standards Table 150-B.
§150(j)2: Cooling system piping (suction, chilled water, or brine lines), and piping insulated between heating source and indirect hot water tank shall be insulated to Table 150-B and Equation 150-A.
§150(j)2: Pipe insulation for steam hydronic heating systems or hot water systems >15 psi, meets the requirements of Standards Table 123-A.
§150(j)3A: Insulation is protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind.
§150(j)3A: Insulation for chilled water piping and refrigerant suction lines includes a vapor retardant or is enclosed entirely in conditioned space.

Mandatory Measures Summary		MF-1R	
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§150(j)4: Solar water-heating systems and/or collectors are certified by the Solar Rating and Certification Corporation.

Ducts and Fans Measures:
§150(m)1: All air-distribution system ducts and plenums installed, are sealed and insulated to meet the requirements of CMC Sections 601, 602, 603, 604, 605 and Standard 6-5; supply-air and return-air ducts and plenums are insulated to a minimum installed level of R-4.2 or enclosed entirely in conditioned space. Openings shall be sealed with mastic, tape or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, or UL 181B or acrosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used.
§150(m)1: Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.
§150(m)2D: Joints and seams of duct systems and their components shall not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.
§150(m)7: Exhaust fan systems have back draft or automatic dampers.
§150(m)8: Gravity ventilating systems serving conditioned space have either automatic or readily accessible, manually operated dampers.
§150(m)9: Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.
§150(m)10: Flexible ducts cannot have porous inner cores.
§150(o): All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2007 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings. Window operation is not a permissible method of providing the Whole Building Ventilation required in Section 4 of that Standard.
Pool and Spa Heating Systems and Equipment Measures:
§114(a): Any pool or spa heating system shall be certified to have: a thermal efficiency that complies with the Appliance Efficiency Regulations; an on-off switch mounted outside of the heater; a permanent weatherproof plate or card with operating instructions; and shall not use electric resistance heating or a pilot light.
§114(b)1: Any pool or spa heating equipment shall be installed with at least 36" of pipe between filter and heater, or dedicated suction and return lines, or built-up connections for future solar heating.
§114(b)2: Outdoor pools or spas that have a heat pump or gas heater shall have a cover.
§114(b)3: Pools shall have directional inlets that adequately mix the pool water, and a time switch that will allow all pumps to be set or programmed to run only during off-peak electric demand periods.
§150(p): Residential pool systems or equipment meet the pump sizing, flow rate, piping, filters, and valve requirements of §150(p).
Residential Lighting Measures:
§150(k)1: High efficacy luminaires or LED Light Engine with Integral Heat Sink has an efficacy that is no lower than the efficacies contained in Table 150-C and is not a low efficacy luminaire as specified by §150(k)2.
§150(k)3: The wattage of permanently installed luminaires shall be determined as specified by §130(d).
§150(k)4: Ballasts for fluorescent lamps rated 13 Watts or greater shall be electronic and shall have an output frequency no less than 20 kHz.
§150(k)5: Permanently installed night lights and night lights integral to a permanently installed luminaire or exhaust fan shall contain only high efficacy lamps meeting the minimum efficacies contained in Table 150-C and shall not contain a line-voltage socket or line-voltage lamp holder; OR shall be rated to consume no more than five watts of power as determined by §130(d), and shall not contain a medium screw-base socket.
§150(k)6: Lighting integral to exhaust fans, in rooms other than kitchens, shall meet the applicable requirements of §150(k).
§150(k)7: All switching devices and controls shall meet the requirements of §150(k)7.
§150(k)8: A minimum of 50 percent of the total rated wattage of permanently installed lighting in kitchens shall be high efficacy. EXCEPTION: Up to 50 watts for dwelling units less than or equal to 2,500 ft ² or 100 watts for dwelling units larger than 2,500 ft ² may be exempt from the 50% high efficacy requirement when: all low efficacy luminaires in the kitchen are controlled by a manual on occupant sensor, dimmer, energy management system (EMCS), or a multi-scene programmable control system; and all permanently installed luminaires in garages, laundry rooms, closets greater than 70 square feet, and utility rooms are high efficacy and controlled by a manual-on occupant sensor.
§150(k)9: Permanently installed lighting that is internal to cabinets shall use no more than 20 watts of power per linear foot of illuminated cabinet.
§150(k)10: Permanently installed luminaires in bathrooms, attached and detached garages, laundry rooms, closets and utility rooms shall be high efficacy.