



## ROOF CURB & UNIT APPLICATION

APPLICATION GUIDE

New Release

Form: 102.20-AG11 (1205)

### GENERAL

This document contains guidelines for installing and sealing roof mounted outdoor HVAC equipment on curbs. The guidelines are not standards, warranties or certifications. These guidelines serve only as a supplement and do not supercede the specific installation instructions supplied with the unit curb. This guide does NOT address roof penetrations.

Roof curbs should be supplied by the HVAC manufacturer to the general contractor or building manufacturer and installed by an experienced erector. Mechanical Contractors should not be asked to supply or install roof curbs for roofing systems. A good penetration requires more than supplying just any roof curb.

Curbs as a component are widely available, but YORK roof-mounted Solution units incorporate only the best, top of the line, high quality roof-curbs. There are many cases where conventional HVAC roof curbs were installed and resulted in a continued maintenance problem for the building owner.

**NOTE** – For more information, please reference: *Air Handling Unit Installation Instructions Form 102.20-N1(1005). Installation Instruction Assembly Sheet shipped with each curb. 'Guidelines for Roof Mounted Outdoor A/C Installations' 2nd Edition, 1997. For flashing details refer to the latest editions of the NRCA Roofing & Waterproofing Manual Constructions Details and the SMACNA Architectural Sheet Metal Manual.*

### RECOMMENDATIONS

YORK recommends that an HVAC factory curb always be provided. YORK curbs are built to fit the unique footprint of each air handler. YORK also provides specific drawing and specification data for each unit and curb. These documents provide vital data such as unit dimensions, weight, component details, cross braces, supply & return opening layout dimensions, and notes which are unique to each unit. Buying a YORK curb ensures that this data is included with each unit.

YORK does not provide roof system materials required in the flashing of a structural member through a roof deck. Thus, the YORK curb does not include a counter-flashing receiver. Never attach roof flashing directly to a YORK rooftop unit.

YORK does not recommend vibration isolation be provided on both the fan skid, inside the unit, and the curb, outside the unit, without credible testing results. Using improperly designed internal and external isolation springs can increase vibration. Dual vibration isolation applications must be designed by a licensed Professional Engineer specializing in vibration isolation design.

### FUNDAMENTALS

#### Typical Roof Curbs

The curb should be structurally capable of supporting intended loads and designed such that drains, power lines, etc., do not penetrate roof flashing. The curb should be furnished with a wood nailer, which provides a minimum of 3.5" of nailer surface, mounted at the top of the curb, to permit mechanical attachment of the flashing material. Caution should be used when considering the use of wood that has been treated with an oil borne preservative for wood nailers. The oil that is used in many lumber treatments can act as a solvent on roofing materials and can cause bitumen drippage. The YORK curb uses only un-treated wood. The curb should provide a minimum clearance of 10 inches between the top of the finished roof surface and the top of the wood nailer, continuous around the curb perimeter. The recommended nominal curb height is at least 14 inches.

#### York Roof Curbs

Curb heights vary in increments of 4.00" from 14.00" to 34.00". The curb dimensions shall be determined using the unit width and length. (Outside curb length = UNIT LENGTH minus 0.875", Outside curb width = UNIT WIDTH minus 0.875"). The curb material will be galvanized steel and may vary from 18 to 14 gage based on the unit load and the quantity of cross bracing provided. The curb material is not painted.

YORK furnishes a wood nailer and gasketing with each curb, but insulation is an option. Although insulated curbs are often specified, the roofing contractor is ultimately responsible to provide roof insulation. It is rare (less than 1% of instances) for a curb manufacturer to provide a flange-turned-out curb that is insulated at the factory. Curbs manufactured for YORK Solution units are flange-turned-out style curbs and therefore do not include factory insulation as a standard.

**ALTERNATE MOUNTINGS**

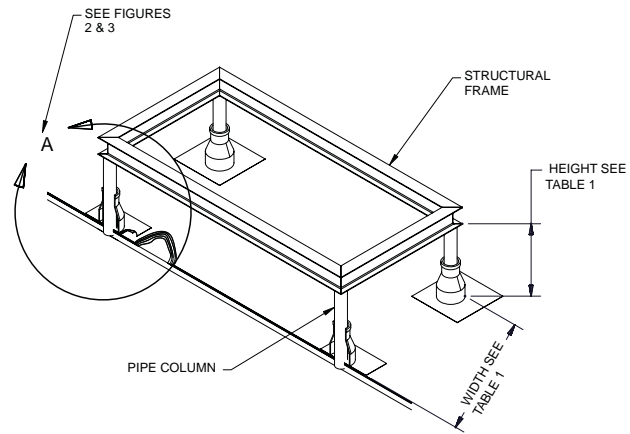
Alternative Stand Mounting consisting of custom structural steel wide flange I-beam frames may be designed to accommodate every variety of mounted heating, ventilating and air conditioning equipment. The custom I-beams should be formed to be an integral part of the AHU Structural Base Rail Support. The AHU must be supported in both length and width to ensure unit integrity. The AHU cannot be mounted in a cantilevered position. See Table 1 for “Working Clearances”. See Figures 1 thru 4 for typical methods of unit supports.

Some mechanical equipment installations require that roofing materials be installed or maintained beneath them. Table 1 presents guidelines for the clearances necessary to accomplish this purpose. Units which allow access from the sides may permit reduction of these values.

**TABLE 1 – WORKING CLEARANCES**

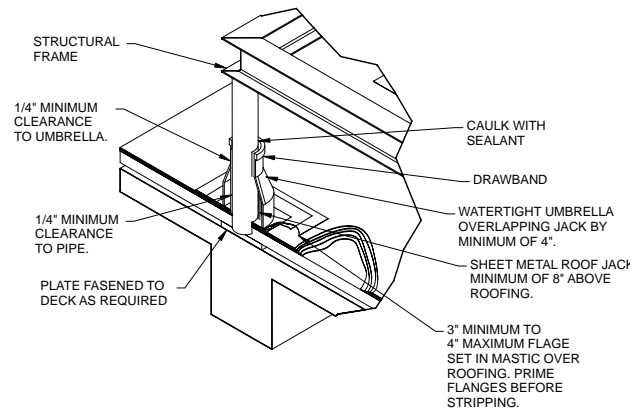
Width of Equipment	Height Above Roof Surfaces
Up to 24"	14"
25" to 36"	18"
37" to 48"	24"
49" to 60"	30"
61" And Wider	48"

Typical methods for flashing of unit supports are shown in Figures 1, 2 and 3.



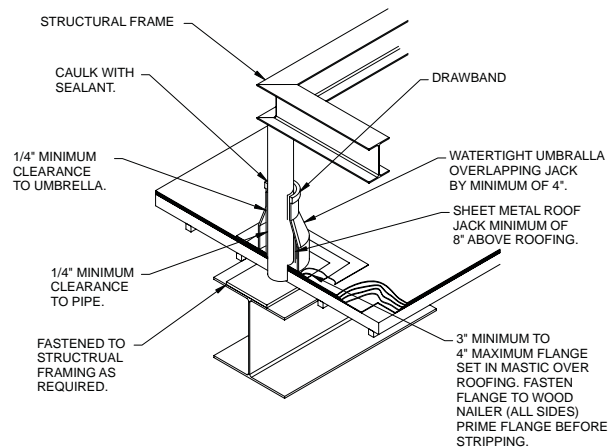
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**FIGURE 1 – MECHANICAL EQUIPMENT STAND (BY OTHERS)**



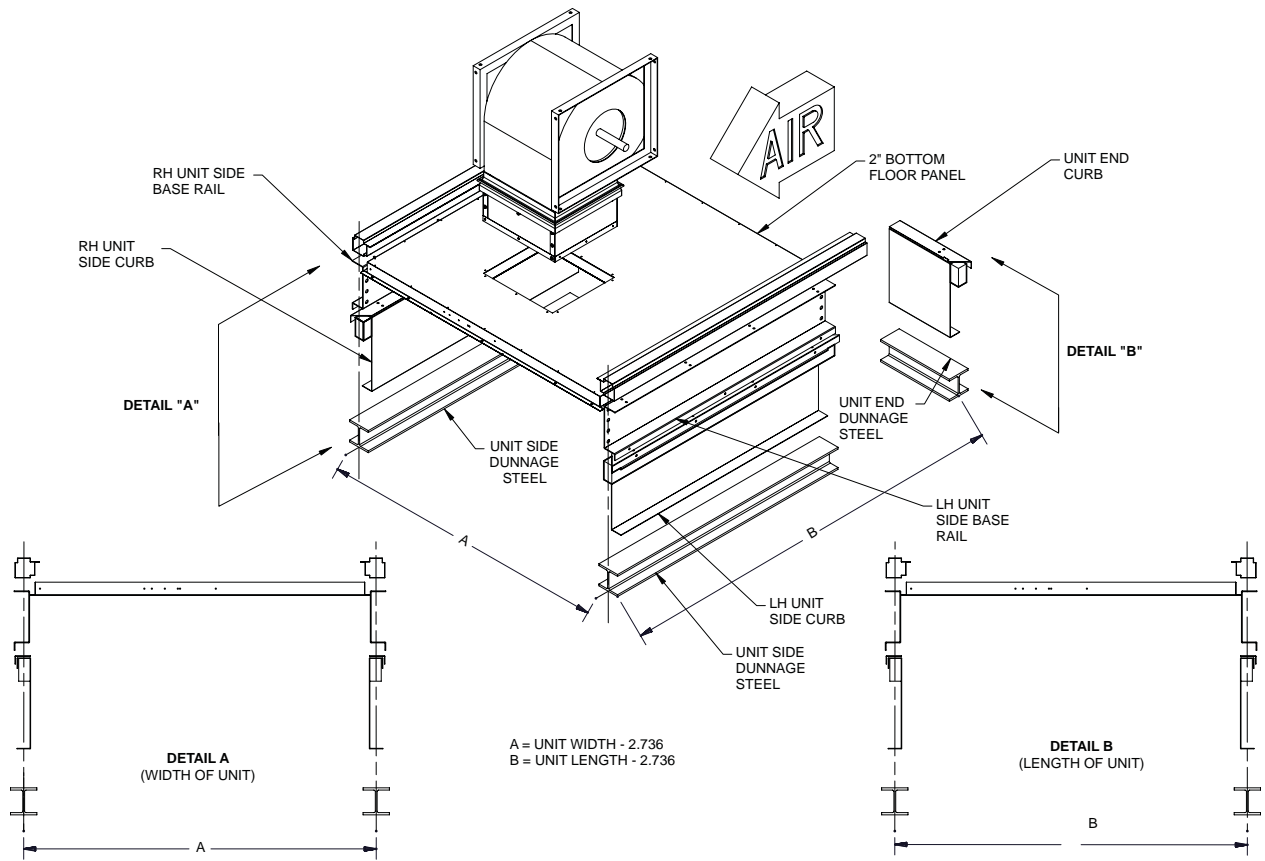
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**FIGURE 2 – CONCRETE DECK AND FRAME**



013-005

**FIGURE 3 – INSULATED STEEL DECK FRAME**



013-009

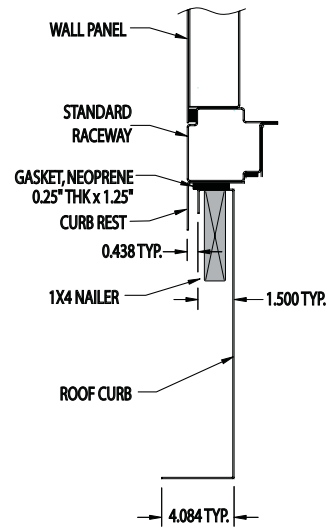
**FIGURE 4 – DUNNAGE STEEL DETAILS**

**BASE RAILS**

YORK factory installs base rails on each unit that requires one. Larger base rails (6", 8", or 10") are optional on each unit. YORK base rails are not insulated. The base rail extends slightly beyond the curb edge and has a slight turn downward over the curb to create a snug perimeter fitting. Since the base rail is a unit option, when ordered, base rails are shown on unit drawings.

**CURB REST**

The 'Curb Rest' is a 14ga. galvanized steel strip attached to the raceway or base rail, which serves to direct, guide or indicate alignment when setting a unit onto the curb. The 'Curb Rest' is not to be considered a flashing receiver for the curb. The hole pattern along the length of the curb rest is intended for securing the curb rest to the shipping material used during unit shipment. Once the shipping material is removed and the unit is placed on the curb, the holes may be used for securing the curb rest to the curb. See figure 5.

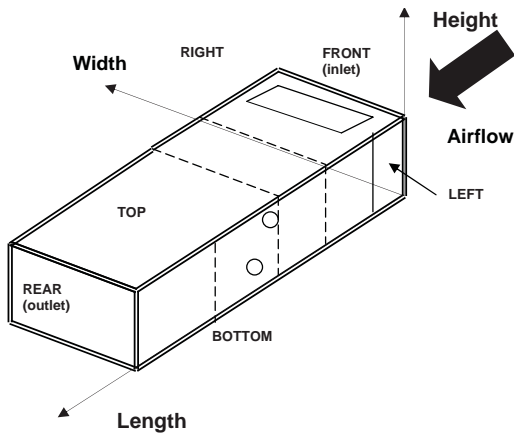


**FIGURE 5 – CURB REST**

## CURB PREPARATION

The YORK Air Handling roof top unit may be factory assembled and shipped in one piece or in a number of sub-assemblies. The contractor should identify each assembly prior to installing the unit. The contractor should follow the installation instructions for assembling and installing units on curbs. Some unit features may extend beyond cabinet dimensions; coil connections, door handles, mounting feet, etc.

Unit & Curb Orientation is critical. The AIR FLOW insignia is shown on curb and unit detail drawings. As a point for reference, the YORK Solution unit has a front, rear, left, right, and top and bottom sides. (See figure 6).



**FIGURE 6 – UNIT & CURB ORIENTATION**

Roof Curb **MUST BE SQUARE & LEVEL** prior to setting equipment. A minimum of one cross brace will be provided with each curb. The maximum spacing between cross braces is 90". Cross braces must not interfere with unit bottom openings or with the pipe chase curb. Braces of the proper quantity, location and material gage to support the unit load will be furnished with the curb.

Prior to setting the unit onto the curb, the installer should ensure that a sealing material is positioned between the unit and the curb to provide a watertight connection. The rooftop unit may be mounted immediately after the curb is installed. Roofing may be completed after setting the unit.

## TYPICAL CURB STYLES

The following are typical curb styles used with YORK SOLUTION roof mounted outdoor units:

### Flat Curbs – See Figure 7

- Curb heights vary in increments of 4.00" from 14.00" to 34.00".
- The curb material is galvanized steel and may vary from 18 to 14 gage based on the unit load and the quantity of cross bracing provided.
- CL (Outside curb length) = Unit length minus 0.875"
- CW (Outside curb width) = Unit width minus 0.875"

### Sloped curbs – See Figure 8

- Long side the maximum Slope = 0.50" in 12.00".
- Short side the maximum Slope = 1.00" in 12.00".
- Curb Height is the height of curb at shorter wall.
- Curb heights vary in increments of 4.00" from 14.00" to 34.00".
- Maximum height of tallest wall will be 42.00".

### Vibration Isolated Curbs – See Figure 12

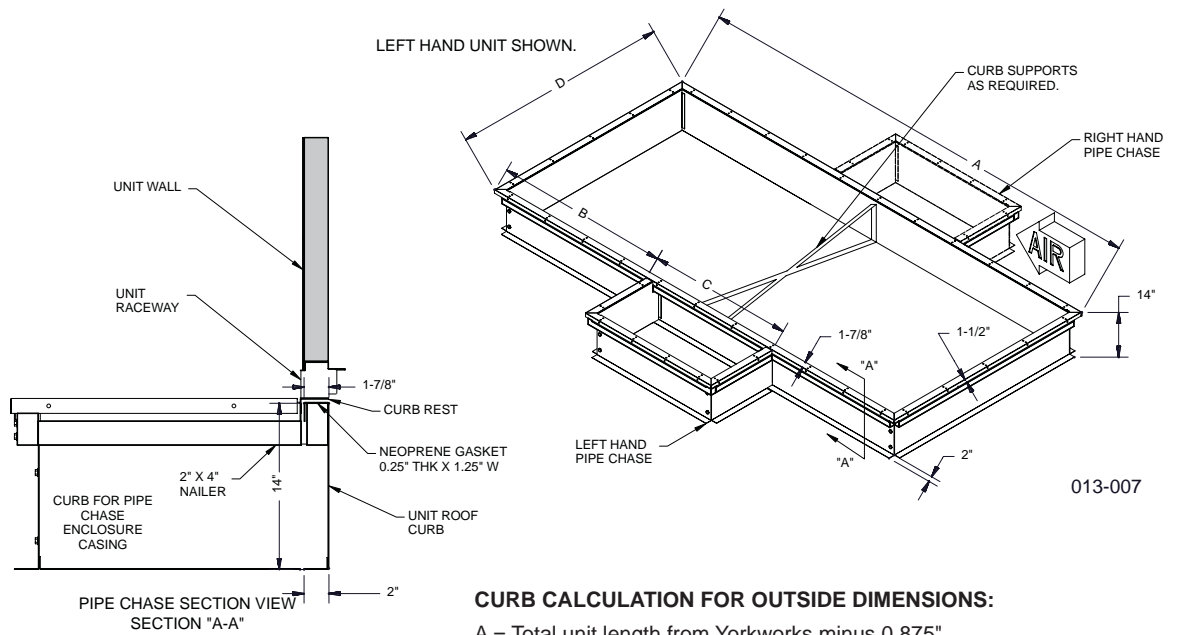
Vibration Isolated curbs is available on a special quoted basis:

- Flat or sloped
- Curb heights vary in increments of 4.00" from 14.00" to 34.00".
- Curb includes vibration isolation between equipment and roof.

### Seismic Curbs – See Figure 12

Seismic curbs are available on a special quoted basis:

- Flat or sloped.
- Curb must be capable of supporting seismic loads of two options.
  - Up to 0.75gs
  - Up to 2.06gs
- Curb heights vary in increments of 4.00" from 14.00" to 34.00".



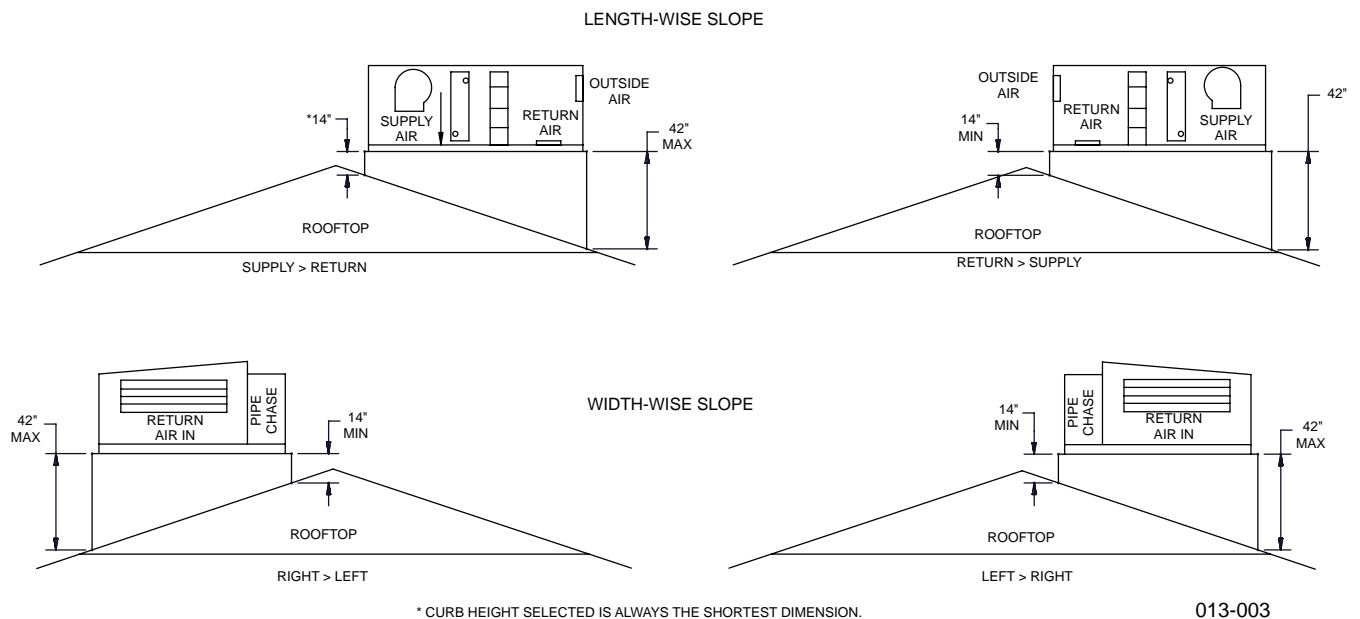
**CURB CALCULATION FOR OUTSIDE DIMENSIONS:**

- A = Total unit length from Yorkworks minus 0.875".
- B = Pipe chase location distance from unit inlet end pipe chase mtg holds will not be included on the curb pipe chase mtg will be field located.
- C = Pipe chase length minus 0.875.
- D = Total unit width from Yorkworks minus 0.875"

**NOTES:**

1. Curb, Curb rest, Nailer, and gasket only, furnished by YORK. All other parts furnished "by others".
2. Roof curb shipped in pieces for field assembly.
3. Roof curb must be installed square and level.
4. Curb heights vary in increments of 4" form 14" to 34".
5. Curb material will be galvanized steel, unpainted, and may vary from 18 to 14 gage based on the unit load and the quantity of cross bracing.
6. Curbs must be fully supported by the roof structure.

**FIGURE 7 – TYPICAL FLAT ROOF CURB**



**FIGURE 8 – SLOPED CURB**

## CURB APPLICATION

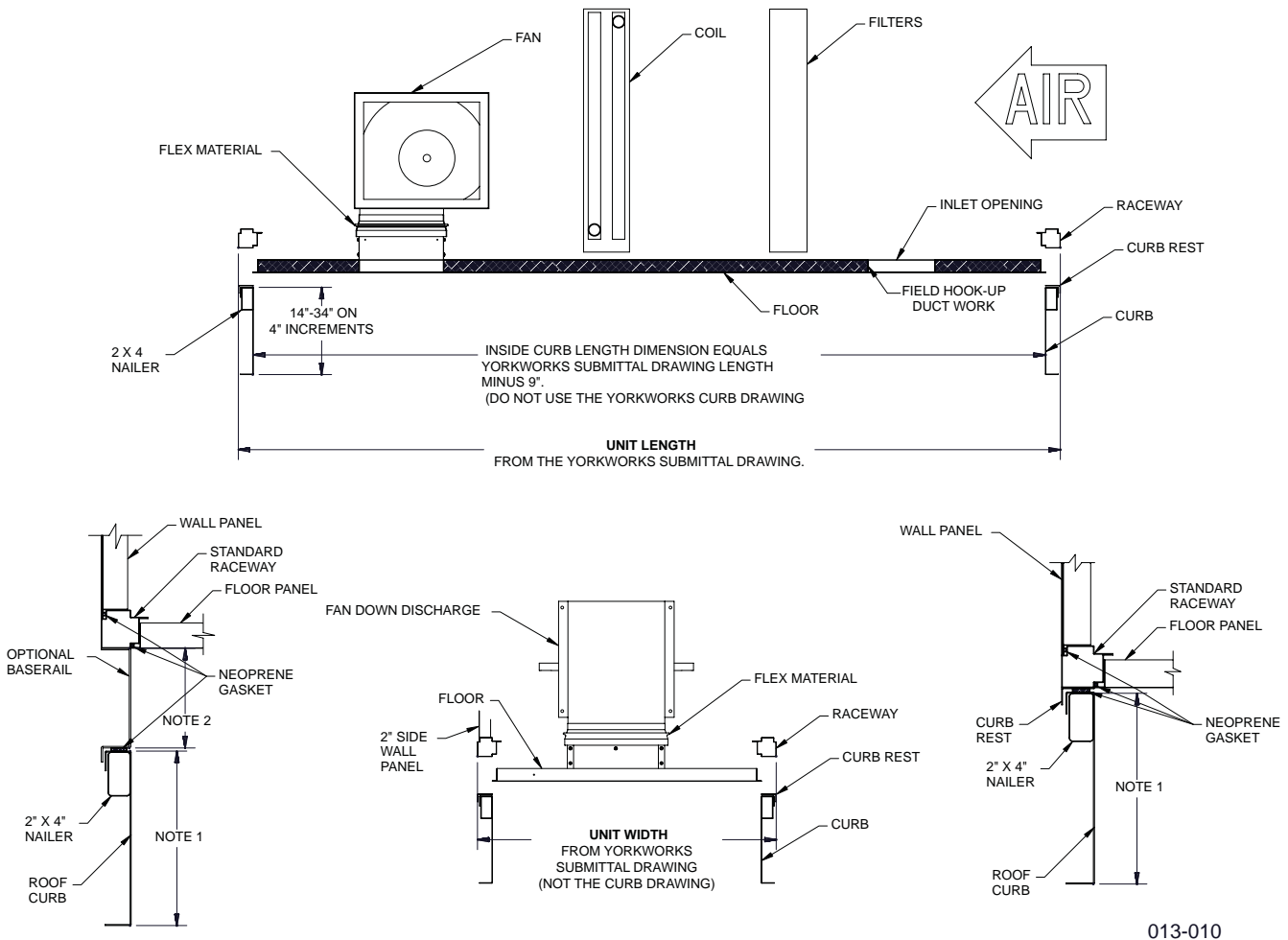
The top of the curb should be level after installation. A separate counter-flashing receiver should be installed prior to the installation of the equipment. All receivers should be of watertight construction. For details concerning counter-flashing receivers refer to the latest edition of The SMACNA Architectural Sheet Metal Manual.

If the installing contractor makes penetrations through the unit floor, care must be taken to seal the penetra-

tion properly to prevent air and water leakage into the curb.

## STRUCTURAL CROSS SUPPORTS

Roof damage may occur when there are no cross supports at the front and rear curb flange. Without full perimeter structural support roof deflection and related damage will occur.



### NOTES:

1. Curbs available 14" thru 34" in 4" increments.
2. Outdoor base rails are available in 3", 6", 8", & 10" heights.
3. Seal all joints and seams with suitable sealer such as sikaflex - 221 (YORK p/n 013-02966-000) or manus bond 75-AM100ZTU (YORK p/n 013-02966-001).

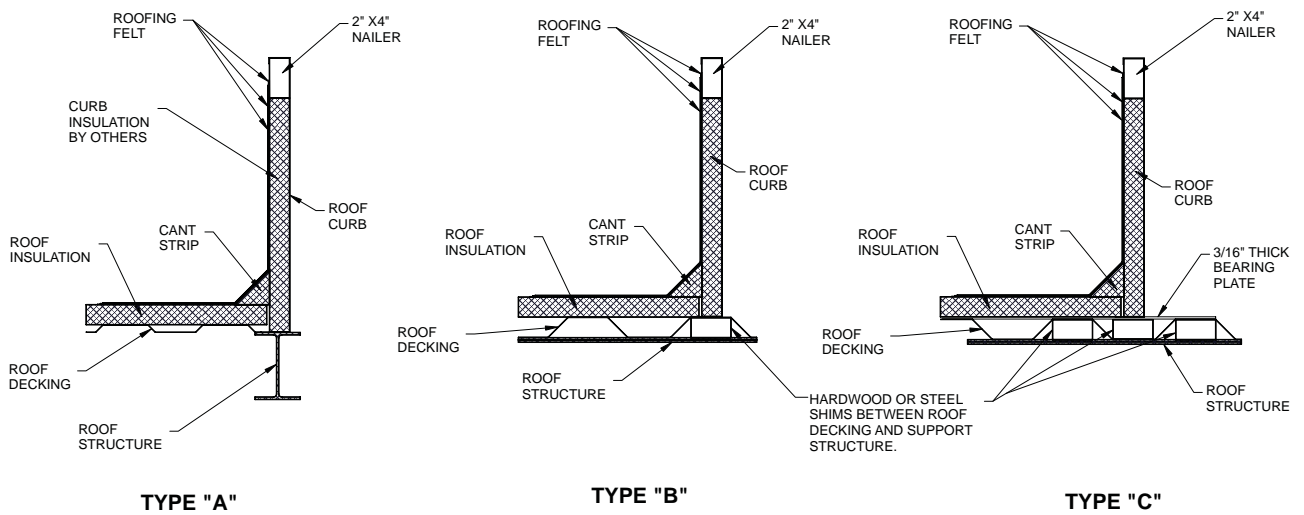
FIGURE 9 – CURB DETAIL

**CURB DRAWINGS**

Compare the curb layout drawing to the submittal documents for the air handler to confirm that the details match. Each air handler has a dedicated drawing that corresponds with the features that are included in the

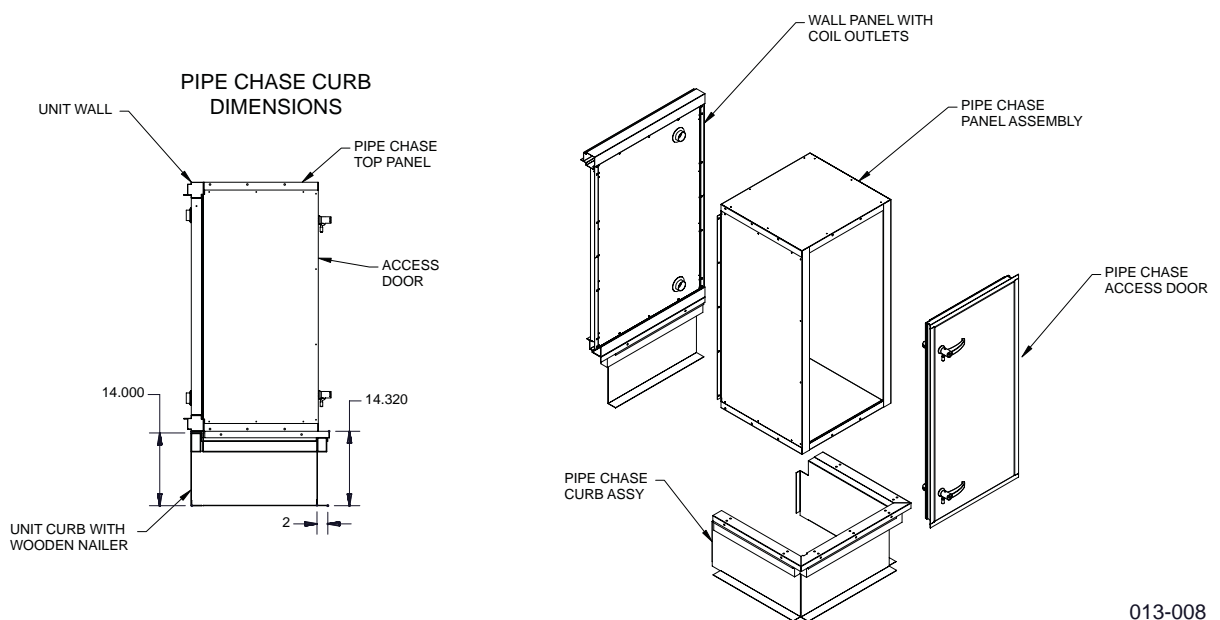
unit. If a pipe chase has been included with the unit, the curb shall include a curb extension for the pipe chase. The pipe chase mounting will need to be field located and drilled. The pipe chase curb will be notched at the top flange so that it can be mounted along the length of the unit. See Figure 11.

**SECTIONAL VIEWS**



013-006

**FIGURE 10 – SUGGESTED CURB INSTALLATION METHODS**



013-008

**FIGURE 11 – PIPE CHASE DETAIL**

## FREQUENTLY ASKED QUESTIONS

### What are spring isolation curbs?

They are roof curbs that incorporate adjustable spring isolators into the curb as a single component. Most isolation curbs are designed for 1" static deflection springs. The springs are mechanically fastened and sized within the frame to ensure uniform deflection for the entire system. The vibration elimination portion of the curb is constructed of structural steel and should be designed to match the bottom of the rooftop unit. Usual operating height is 21" with options for different heights.

### When would I need a curb with spring isolation?

Whenever the roof may be subjected to harmful vibrations from roof mounted equipment. Rotating mechanical equipment systems are capable of producing natural frequencies or vibrations that annoy the occupants of a building, disturb sensitive equipment and can cause structural fatigue. If ignored, harmful frequencies/vibrations can lead to potentially hazardous situations. Spring isolation curbs help to eliminate vibration and structural fatigue problems.

### What is structural fatigue?

Fatigue is damage caused by repeated cycling of a specific load. Load cycling causes progressive localized damage to many materials. Most fatigue cracks initiate and propagate in regions where the strain is most severe. The process of fatigue consists of three stages; initial crack initiation, progressive crack growth across the material and final sudden fracture of the remaining cross section.

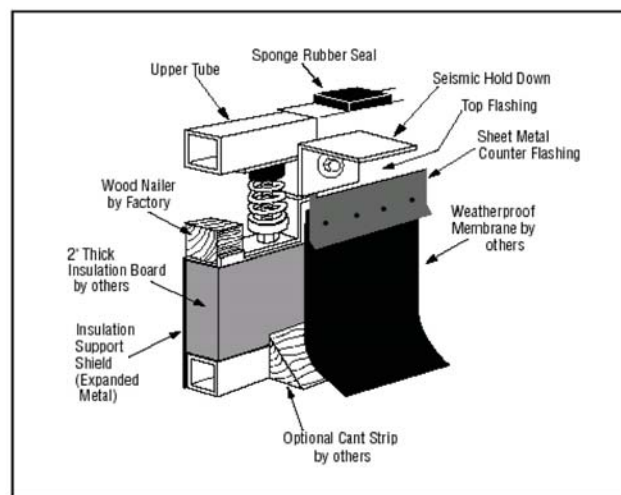
### What is Fatigue Analysis?

A fatigue analysis is a study of the structural parts of a building and the effects that vibration-producing equipment have on the building, other components, and the equipment itself. Engineering firms that specialize in the fields of vibration, noise and acoustics should be consulted. An analysis would indicate if a curb with spring isolation and isolation rail is needed.

### What are seismic isolation curbs?

The seismic isolation curb incorporates a fully adjustable support system specifically designed for unit vibration and seismic/wind restraint. Most seismic zones require a seismic isolation rail as part of the roof curb. [Reference: American Society of Civil Engineers (ASCE 7-02 section 9) & International Building Code 2003( IBC – 2003 section 1621)]

Seismic isolation curbs are designed to meet superimposed live and dead loads, including equipment and other construction loads, to be supported on the curb. The curb contains mountings designed and rated to resist seismic forces in all directions. A typical example is shown in Figure 12 below.



**FIGURE 12 – ROOF CURB WITH SEISMIC / WIND RESTRAINT.**

### Who installs the insulation required to prevent curb condensation?

The roofing contractor usually provides insulation in the roof curb.

### REFERENCES:

*Guidelines for Roof Mounted Air-Conditioner Installations” (2nd Edition, 1997)*

Prepared by: Air-Conditioning and Refrigeration Institute, National Roofing Contractors’ Association, Sheet Metal and Air-Conditioning Contractors National Association; 1997.

