2006/2009 IBC SEISMIC AND WIND RESTRAINT REQUIREMENTS

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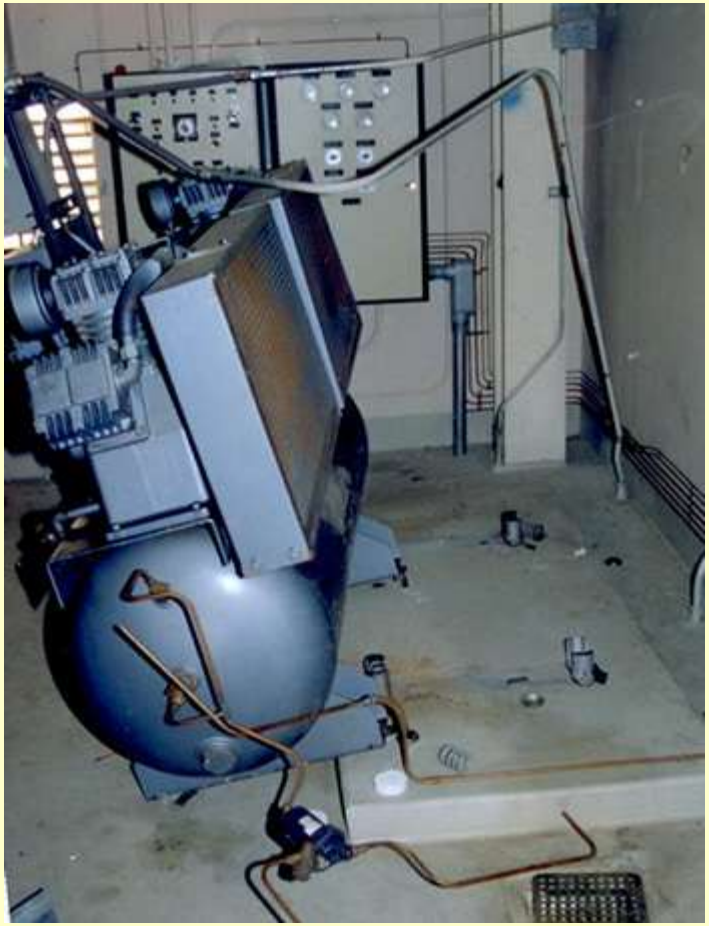
WHAT IS THE CURRENT MODEL CODE IN NEW YORK STATE?

THE CODE

THE CURRENT NEW YORK BUILDING CODE IS MODELED AFTER 2006 IBC. THE SEISMIC RESTRAINT OF MEP (NONSTRUCTURAL) COMPONENTS IS BASED ON CHAPTER 13 OF ASCE 7-05.

WHY ARE SEISMIC RESTRAINTS NEEDED?

AIR COMPRESSOR SHIFTED OFF ISOLATORS

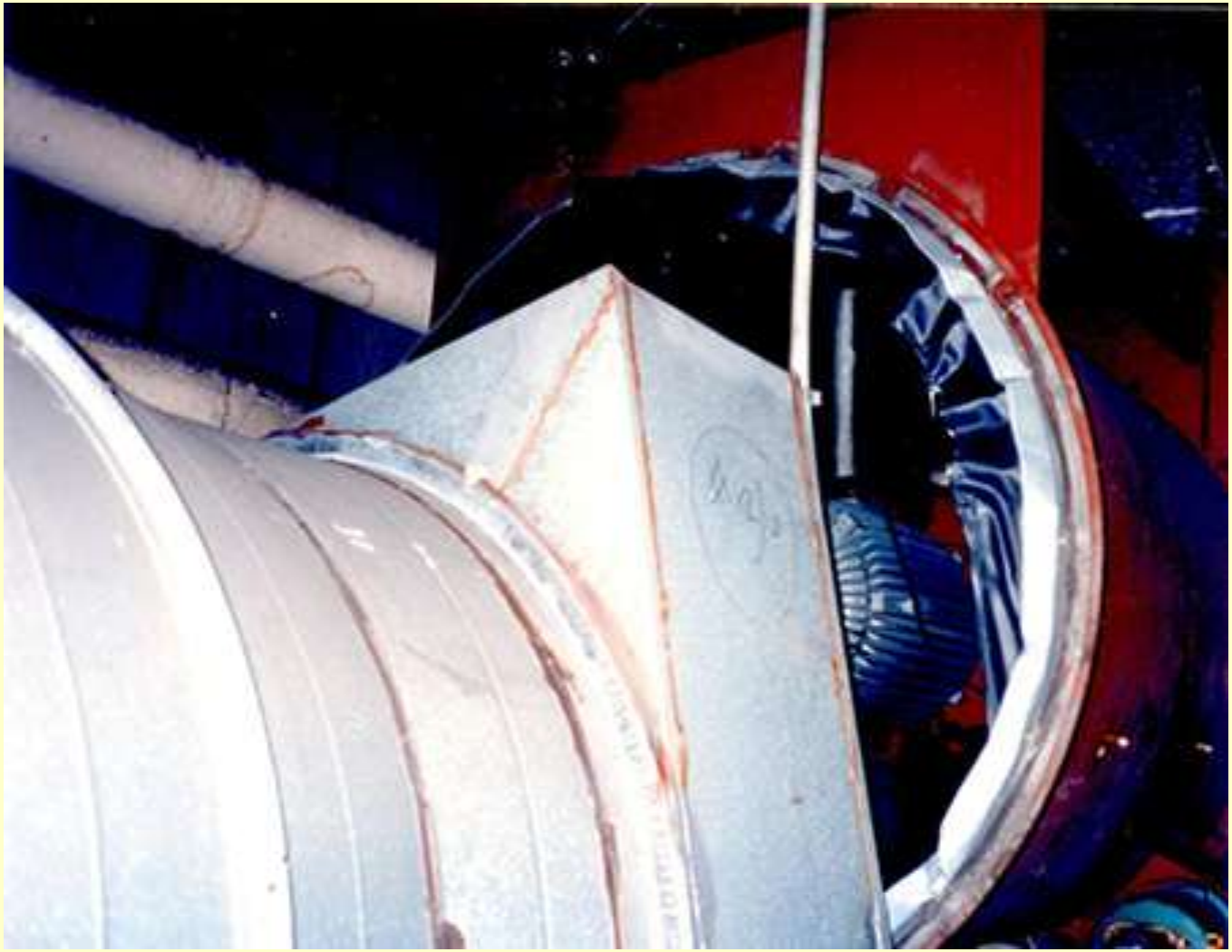


PUMP SHIFTED OFF ISOLATORS

SUPPORT STEEL FAILURE

COOLING TOWER FRAME FAILURE

FAN & DUCT FAILURE



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DOES MY PROJECT REQUIRE SEISMIC RESTRAINT?

THAT DEPENDS ON

1) OCCUPANCY CATEGORY

2) SEISMIC DESIGN CATEGORY

3) COMPONENT IMPORTANCE FACTOR

BY OTHERS

1) OCCUPANCY CATEGORY – BUILDING OWNER & ARCHITECT

2) SEISMIC DESIGN CATEGORY – STRUCTURAL ENGINEER

BOTH ARE AVAILABLE ON THE FIRST SHEET FROM THE STRUCTURAL DRAWINGS

OCCUPANCY CATEGORY

ASCE 7-05 Table 1-1

I & II) – BUILDINGS WITH LOW RISK TO HUMAN LIFE SUCH AS AGRICULTURAL BUILDINGS.

III) – HIGH OCCUPANCY BUILDINGS SUCH AS SCHOOLS AND OFFICE BUILDINGS.

IV) – ESSENTIAL FACILITIES SUCH AS HOSPITALS, POLICE STATIONS, FIRE STATIONS, AND ETC.

SEISMIC DESIGN CATEGORY

ASCE 7-05 Sec 11.6

VARIES FROM A TO F. WHERE A IS THE LEAST STRINGENT AND F IS THE MOST STRINGENT.

BY YOU

THE COMPONENT IMPORTANCE FACTOR

ASCE 7-05 Sec 13.1.3

THIS WILL HAVE A VALUE OF EITHER 1.0 OR 1.5

I_P=1.5 IF

LIFE SAFETY COMPONENTS REQUIRED TO FUNCTION AFTER AN EARTHQUAKE.

1) **FIRE SUPPRESSION SYSTEMS (ALL OCCUPANCY CATEGORIES).**
2) **SMOKE EVACUATION SYSTEMS (ALL OCCUPANCY CATEGORIES).**
3) **NEARLY EVERYTHING IN OCCUPANCY CATEGORY IV BUILDINGS.**

I_P=1.5 IF

COMPONENTS CONTAIN HAZARDOUS (BIO-HAZARDOUS) MATERIALS.

1) BIO-HAZARDOUS LAB EXHAUST FANS AND DUCT.

2) PROCESS PIPING & EQUIPMENT CARRYING FLAMMABLE, EXPLOSIVE, OR CAUSTIC MATERIALS.

3) DUCT AND ATTACHED EQUIPMENT CARRYING FLAMMABLE, EXPLOSIVE, OR CAUSTIC MATERIALS.

I_P=1.5 IF

COMPONENTS WHOSE FAILURE WOULD IMPAIR THE CONTINUED OPERATION OF THE FACILITY OR CLOSE THE FACILITY FOR OCCUPANY CATEGORY IV FACILITIES.

OCCUPANCY CATEGORY IV CONT.

1) PLUMBING SYSTEMS INCLUDING DRAIN, WASTE, AND VENT LINES.
2) AIR HANDLING AND CONDITIONING SYSTEMS.
3) ELECTRICAL SUPPLY AND CONTOL SYSTEMS.
4) COMMUNICATION SYSTEMS INCLUDING SERVERS AND NETWORKS.

WHAT ARE THE GENERAL CODE BASED EXEMPTIONS?

SEISMIC RESTRAINT IS NOT *REQUIRED* FOR MEP COMPONENTS IF

1) THE SEISMIC DESIGN CATEGORY IS EITHER A OR B. ASCE 7-05 Sec 13.1.4.2

2) THE SEISMIC DESIGN CATEGORY IS C *AND* COMPONENT IMPORTANCE IS *1.0* AND ITS FAILURE CAN NOT IMPACT THE PERFORMANCE OF AN IMPORTANCE FACTOR *1.5* COMPONENT. ASCE 7-05 Sec 13.1.4.3

SEISMIC RESTRAINTS ARE NOT REQUIRED FOR FLOOR MOUNTED MEP COMPONENTS IN SEISMIC DESIGN CATEGORIES D, E, & F IF I_p=1.0 AND

1) FLEXIBLE CONNECTIONS ARE PROVIDED BETWEEN THE COMPONENT AND THEIR SERVICES ASCE 7-05 Sec 13.1.4 (4a)

2) THE COMPONENTS ARE MOUNTED @ 4 FT OR LESS ABOVE THE FLOOR LEVEL AND WEIGH 400 LBS OR LESS. ASCE 7-05 Sec 13.1.4 (4b)

SEISMIC RESTRAINTS ARE NOT REQUIRED FOR WALL OR CEILING MOUNTED MEP COMPONENTS WEIGHING 20 LBS OR LESS IN SEISMIC DESIGN CATEGORIES D, E, & F IF I_p=1.0 AND FLEXIBLE CONNECTIONS ARE PROVIDED BETWEEN THE COMPONENTS AND THEIR SERVICES. **ASCE 7-05 Sec 13.1.4 (5a)**

SEISMIC RESTRAINTS ARE NOT REQUIRED FOR MEP DISTRIBUTION SYSTESM WEIGHING 5 LB/FT OR LESS IN SEISMIC DESIGN CATEGORIES D, E, & F IF I_p=1.0. ASCE 7-05 Sec 13.1.4 (5b)

ARE THERE ANY OTHER EXEMPTIONS FOR PIPE?

PIPE EXEMPTIONS

- 12” RULE: SEISMIC RESTRAINTS ARE NOT REQUIRED FOR PIPE IF ALL OF THE HANGERS IN THE RUN ARE 12” OR LESS IN LENGTH FROM THE SUPPORTING STRUCTURE AND NO DAMAGE CAN OCCUR FROM THE EXPECTED SWING OF THE PIPE. ASCE 7-05 Sec 13.6.8.1
- SEISMIC DESIGN CATEGORY D, E, OR F WITH A COMPONENT IMPORTANCE FACTOR OF 1.5: SEISMIC RESTRAINTS ARE NOT REQUIRED FOR PIPES OF A NOMINAL SIZE OF 1” OR LESS. ASCE 7-05 Sec 13.6.8 (2a)

PIPE EXEMPTIONS CONT.

- **SEISMIC DESIGN CATEGORY D, E, OR F WITH A COMPONENT IMPORTANCE FACTOR OF 1.0: SEISMIC RESTRAINTS ARE NOT REQUIRED FOR PIPES OF A NOMINAL SIZE OF 3” OR LESS. ASCE 7-05 Sec 13.6.8 (2b)**
- **SEISMIC DESIGN CATEGORY C WITH A COMPONENT IMPORTANCE FACTOR OF 1.5: SEISMIC RESTRAINTS ARE NOT REQUIRED FOR PIPES OF A NOMINAL SIZE OF 2” OR LESS. ASCE 7-05 Sec 13.6.8 (2c)**

PIPE EXEMPTIONS CONT.

FOR APPLYING EXEMPTIONS TO TRAPEZE SUPPORTED PIPE SEE;

“SEISMIC EXEMPTIONS FOR SUSPENDED TRAPEZE SUPPORTED PIPE – IBC 2006/ASCE 7-05 (SUMMARY)”

AVAILABLE ON THE VISCMA (VIBRATION ISOLATION AND SEISMIC CONTROLS MANUFACTURER’S ASSOCIATION) WEB SITE.

www.viscma.com

WHAT EXEMPTIONS APPLY TO DUCT

DUCT EXEMPTIONS

THE FOLLOWING EXEMPTIONS WILL APPLY FOR DUCT IF I_p=1.0 AND EITHER OF THE FOLLOWING ARE MET: ASCE 7-05 Sec 13.6.7 (a) & (b)

1. **ALL OF THE HANGERS IN A RUN OF DUCT ARE 12 IN. IN LENGTH FROM THE TOP OF THE DUCT TO THE SUPPORTING STRUCTURE AND THE HANGERS ARE DETAILED TO AVOID BENDING OF THE HANGER & ITS ATTACHMENT.**
2. **THE DUCTS HAVE A CROSS-SECTIONAL AREA OF LESS THAN 6 $FT^{2.}$**

DUCT EXEMPTIONS cont'd

ALSO UNDER SECTION 13.6.7 IT STATES THAT "HVAC DUCT SYSTEMS FABRICATED AND INSTALLED IN ACCORDANCE WITH STANDARDS APPROVED BY THE AUTHORITY HAVING JUSRISDICTION SHALL BE DEEMED TO MEET THE LATERAL BRACING REQUIREMENTS OF THIS SECTION."

DUCT ALLOWANCE

ASCE 7-05 SEC 13.6.7

MEP COMPONENTS MOUNTED IN-LINE WITH THE DUCT SYSTEM, AND HARD CONNECTED TO THE DUCT ON AT LEAST ONE END, WEIGHING 75 LBS OR LESS MAY BE RESTRAINED AS THOUGH THEY WERE PART OF THE DUCT SYSTEM.

2009 IBC

2009 IBC SECTION 1613.6.8.2

FOR I_p=1.5 DUCTS HAVING A CROSS-SECTIONAL AREA OF LESS THAN 6 FT^2 ARE EXEMPT.

WHAT ARE THE ELECTRICAL EXEMPTIONS?

2006/2009 IBC – I_p=1.0

1. **ELECTRICAL COMPONENTS ARE EXEMPT.** ASCE 7-05 SEC 13.6.4
2. **DISTRIBUTION SYSTEMS ARE EXEMPT.** ASCE 7-05 SEC 13.6.4 & 13.6.5.5 (6a)
   (IF HANGERS ARE ANCHORED TO CONCRETE WEDGE TYPE EXPANSION ANCHORS SHOULD BE USED.)

2006/2009 IBC – I_p=1.5

1. CONDUIT THAT IS LESS THAN 2.5 IN. TRADE SIZE IS EXEMPT. ASCE 7-05 SEC 13.6.5.5 (6a)
2. TRAPEZE ASSEMBLIES SUPPORTING CONDUIT, BUS DUCTS, OR CABLE TRAYS THAT WEIGH 10 LBS/FT OR LESS ARE EXEMPT. ASCE 7-05 SEC 13.6.5.5 (6b)

(FOR BOTH CASES, IF THE HANGERS ARE ATTACHED TO CONCRETE, WEDGE TYPE EXPANSION ANCHORS SHOULD BE USED.)

HOW ARE EXISTING BUILDINGS TREATED?

INDEPENDENT ADDITIONS

ADDITIONS THAT ARE STRUCTURALLY INDEPENDENT FROM THE ORIGINAL BUILDING MUST BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE SEISMIC REQUIREMENTS FOR NEW BUILDINGS. ASCE 7-05 APPENDIX 11B SECTION 11B.2 & 2006 IBC SECTION 3403.2.3.1

DEPENDENT ADDITIONS

ADDITIONS THAT ARE NOT STRUCTURALLY INDEPENDENT FROM THE ORIGINAL BUILDING MUST BE DESIGNED AND CONSTRUCTED SUCH THAT THE ENTIRE STRUCTURE CONFORMS TO SEISMIC REQUIREMENTS FOR NEW BUILDINGS. ASCE 7-05 APPENDIX 11B SECTION 11B.3 & 2006 IBC SECTION 3403.2.3.1

(EXCEPTIONS)

THE ENTIRE STRUCTURE NEED NOT CONFORM TO THE SEISMIC FORCE REQUIREMENTS FOR NEW STRUCTURES IF ALL OF THE FOLLOWING ARE MET.

1)THE NEW ADDITION MEETS THE SEISMIC FORCE REQUIREMENTS FOR NEW BUILDINGS. 2006 IBC 3403.2.3.1 (1).

2)THE NEW ADDITION DOES NOT INCREASE THE SEISMIC FORCES IN ANY ELEMENT OF THE EXISTING BUILDING BY MORE THAN 10%. 2006 IBC 3403.2.3.1 (2)

3)THE NEW ADDITION DOES NOT DECREASE THE SEISMIC FORCE RESISTING CAPACITY OF ANY ELEMENT OF THE EXISTING BUILDING BY MORE THAN 10%. 2006 IBC 3403.2.3.1 (3)

ALTERATIONS (RENOVATIONS)

ALTERATIONS ARE PERMITTED TO ANY STRUCTURE W/O BEING REQUIRED TO COMPLY WITHT THE SEISMIC FORCE REQUIREMENTS FOR NEW STRUCTURES PROVIDED THAT THE ALTERATIONS DO NOT INCREASE THE SEISMIC FORCE IN ANY ELEMENT BY MORE THAN 10% OR DECREASE THE SEISMIC CAPACITY OF ANY ELEMENT BY MORE THAN 5%. BEYOND THESE LIMITS, THE STRUCTURE MUST BE REINFORCED. ASCE 7-05 APPENDIX 11B SECTION 11B.4 & 2006 IBC SECTION 3403.2.3.2

(EXCEPTION NON-STRUCTURAL ELEMENTS)

AN ENGINEERING ANALYSIS IS SUBMITTED INDICATING THAT THE NEW OR RELOCATED NON-STRUCTURAL ELEMENTS ARE DETAILED AND CONNECTED TO EXISTING OR NEW STRUCTURE IN A MANNER CONFORMING WITH THE SEISMIC FORCE REQUIREMENTS FOR NEW CONSTRUCTION. 2006 IBC SEC 3403.2.3.2 (4)

IF I NEED RESTRAINTS, HOW DO I SELECT THEM?

RESTRAINT SELECTION

THIS IS MOST EASILY & GENERALLY PERFORMED BY THE MANUFACTURER OF THE SEISMIC RESTRAINTS.

THE INFORMATION NEEDED BY MANUFACTURER TO SELECT RESTRAINTS IS AS FOLLOWS:

FROM THE FIRST SHEET OF THE STRUCTURAL DRAWINGS

1) THE APPLICABLE BUILDING CODE OR CODES

2) SEISMIC DESIGN CATEGORY

3) S_{DS} OR S_S (SHORT PERIOD ACCELERATION)

4) SITE CLASS (SOIL TYPE)

FROM THE SPECIFICATION

THE SEISMIC PORTION OF THE SPECIFICATION WILL ALERT THE MANUFACTURER OF THE RESTRAINT SYSTEM'S DESIGNER TO ANY SPECIAL CONSIDERATIONS.

INFO FOR PIPING

1) THE COMPONENT IMPORTANCE FACTOR
2) PIPING LAYOUT WITH PIPE SIZES, CONNECTIONS, & MATERIALS
3) WHETHER THE PIPING IS FOR DOMESTIC HOT WATER, DOMESTIC COLD WATER, MEDICAL GAS, NATURAL GAS, VACUUM, DRAIN, WASTE, OR VENT.
4) IDENTIFICATION OF ANY PIPING RUNS THAT ARE TO BE TRAPEZE SUPPORTED

INFO FOR EQUIPMENT

1) THE COMPONENT IMPORTANCE FACTOR
2) CUT SHEETS WITH COMPLETE DIMENSIONS AND, IF APPLICABLE, MOUNTING LOCATIONS
3) OPERATING WEIGHT OF THE EQUIPMENT
4) THE BUILDING HEIGHT AND THE VERTICAL LOCATION OF THE EQUIPMENT IN THE BUILDING

WHAT ABOUT ANCHORAGE OF MEP COMPONENTS?

SEISMIC RESTRAINTS

ASCE 7-05 Sec 13.4

1) FORM THE LOAD PATH BETWEEN THE MEP COMPONENT AND THE BUILDING STRUCTURE.

2) MUST BE ATTACHED TO A PORTION OF THE BUILDING STRUCTURE THAT IS CAPABLE OF CARRYING THE EXPECTED SEISMIC LOADS.

CONCRETE ANCHORS

1) FOR BOTH 2006 IBC AND 2009 IBC, CONCRETE ANCHORS FOR SEISMIC APPLICATIONS MUST BE PRE-QUAILFIED PER ACI 355.2 (ICC AC 193), AND HAVE AN ICC-ESR. ASCE 7-05 SEC13.4.2

2) DROP-IN TYPE ANCHORS ARE NOT PERMITTED. ASCE 7-05 SEC13.4.2

3) POWDER SHOT PINS ARE NOT PERMITTED IN TENSION APPLICATIONS. ASCE 7-05 SEC13.4.5

HOUSEKEEPING PADS MUST BE EITHER; ASCE 7-05 SEC 13.4

1) DOWLED TO THE STRUCTURAL SLAB.

2) BE A MONLITHIC POUR WITH THE STRUCTURAL SLAB.

FRICTION?

ASCE 7-05 SEC 13.4.6

1) **FRICTION CLIPS MAY NOT BE USED FOR SEISMIC RESTRAINT ATTACHMENT.**

2) **FRICTION DUE TO GRAVITY LOADS MAY NOT BE COUNTED ON FOR SEISMIC RESTRAINT.**

BEAM CLAMPS?

C-TYPE BEAM CLAMPS MAY ONLY BE USED FOR RESTRAINT ATTACHMENT IFTHEY INCLUDE A SAFETY STRAP THAT CAN RESIST THE DESIGN LOADS. THEY ARE CONSIDERED TO BE A FRICTION CLIP.

MECHANICAL EQUIPMENT OVER 10 HP

ASCE 7-05 SEC 13.6.5.5 (5)

2006 IBC: NON-ISOLATED MECHANICAL EQUIPMENT OVER 10 HP WILL REQUIRE UNDERCUT OR ADHESIVE ANCHORS.

WHAT CAN THE WIND DO TO MY EQUIPMENT?

WIND DAMAGE

WIND DAMAGE

WIND DAMAGE

WIND DAMAGE

WIND DAMAGE

DOES MY PROJECT REQUIRE WIND RESTRAINT?

YES!

FOR ANY COMPONENT OR EQUIPMENT EXPOSED IN ANY WAY TO THE EFFECTS OF THE WIND

THERE ARE NO EXEMPTIONS FOR EXPOSED COMPONENTS

2006/2009 IBC SECTION 1609.1

“BUILDINGS, STRUCTURES AND PARTS THEREOF SHALL BE DESIGNED TO WITHSTAND THE MINIMUM WIND LOADS PRESCRIBED HEREIN. DECREASES IN WIND LOADS SHALL NOT BE MADE FOR THE EFFECT OF SHIELDING BY OTHER STRUCTURES.”

2006/2009 IBC SECTION 1609.1.1

"WIND LOADS ON EVERY BUILDING OR STRUCTURE SHALL BE DETERMINED IN ACCORDANCE WITH CHAPTER 6 OF ASCE 7…"

2006/2009 IBC HORIZONTAL DESIGN WIND LOAD

IS DEFINED BY ASCE 7-05 SECTIONS 6.5.15 & 6.5.15.1 AND IS ROUGHLY TWICE THAT SPECIFIED IN 2003 IBC

2006/2009 IBC DESIGN WIND UPLIFT LOAD

IS RECOMMENDED BY ASCE 7-05 SECTION C6.5.11 (page 300) AND WILL BE ESTIMATED AS SLIGHTLY GREATER HALF THE HORIZONTAL DESIGN LOAD

HOW DO I SELECT THE PROPER RESTRAINTS?

TYPES OF RESTRAINTS USED

THE SAME TYPES OF RESTRAINTS AND ANCHORS USED FOR SEISMIC CONDITIONS ARE ALSO USED FOR WIND APPLICATIONS.

RESTRAINT SELECTION

AS WITH SEISMIC RESTRAINTS, THIS IS MOST EASILY & GENERALLY PERFORMED BY THE MANUFACTURER OF THE RESTRAINTS.

THE INFORMATION NEEDED BY MANUFACTURER TO SELECT RESTRAINTS IS AS FOLLOWS:

FROM THE FIRST SHEET OF THE STRUCTURAL & ARCHITECTURAL DRAWINGS

1) THE APPLICABLE BUILDING CODE OR CODES
2) EXPOSURE CATEGORY
3) DESIGN WIND SPEED
4) MEAN BUILDING HEIGHT

REQUIRED EQUIPMENT INFO

1) CUT SHEETS WITH COMPLETE DIMENSIONS AND, IF APPLICABLE, MOUNTING LOCATIONS
2) OPERATING WEIGHT OF THE EQUIPMENT
3) DUNNAGE & SUPPORT STEEL HEIGHT IF APPLICABLE

TYPICAL RESTRAINTS USED FOR WIND

POST TYPE 3-AXIS RESTRAINT

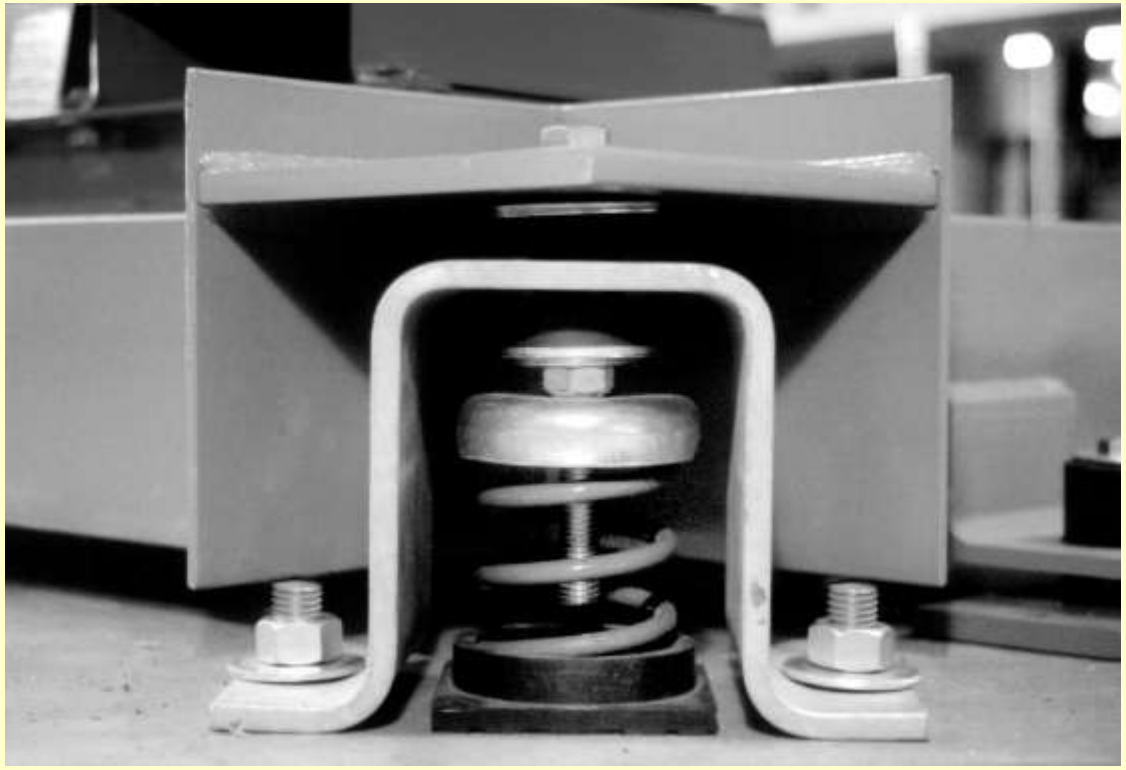

PLATE TYPE 3-AXIS RESTRAINT

PLATE TYPE 3-AXIS RESTRAINT

STRUCTURAL ISOLATION CURB WITH 3-AXIS RESTRAINTS

STRUCTURALSHEET METAL CURB WITH RESTRAINTS

NON-ISOLATED STRUCTURAL CURB

LOAD PATH! LOAD PATH! LOAD PATH!

1. EQUIPMENT MUST BE ATTACHED TO THE RESTRAINTS/CURBS.

2. RESTRAINTS/CURBS MUST BE ATTACHED TO THE BUILDING STRUCTURE.

THANK YOU FOR YOUR ATTENTION