

INSPECTION PREPARATION CHECKLIST

In preparation for a field inspection, the following is a list of recommended inspection items and project documents that will be needed in the field to document the conformance of the project under review to the certifications provided by KNC.

Before even considering performing a review, the individual performing the inspection must have a thorough knowledge of what is required for seismic compliance. This includes at least 4 hours of training in this area from Kinetics office staff and a good broad knowledge of what is in the Kinetics Seismic Design and Pipe and Duct manuals and how to quickly locate answers to specific questions.

Tools:

- 1) Camera (4 mp or higher resolution digital camera that can produce decent pictures in relatively low light conditions.)
- 2) Tape Measure (Good for measuring equipment dimensions, edge distances, etc)
- 3) Ultrasonic measuring device (for working with longer spans like pipe and duct)
- 4) Flashlight
- 5) Laser pointer (not required, but handy if it is planned that you will be pointing things out to contractors in the field.)
- 6) Hard clip pad that can act as a surface to write against
- 7) Colored pens that will show up clearly when writing on black and white documents.
- 8) Additional paper for sketches and other notes

Project Documentation:

- 1) Clear definition of Project Scope as defined and agreed to at the proposal level (this can serve to limit scope creep when we are looking at things in the field).
- 2) A copy of the applicable submittal documentation packet (letter size docs) provided by KNC for the equipment/systems under review.
- 3) A copy of all applicable pipe/duct/electrical distribution drawings. Ideally these should be in an easily handled size (like 11 x 17), but only as long as the reduced size is legible and can easily be worked with.
- 4) A numbered listing of potential deficiencies likely to be present on equipment, piping/ductwork/electrical distribution systems being inspected that can act as a key when marking comments on the "inspection" copy of the drawings or other documents.

Additional Support Information:

- 1) Either a thorough and complete knowledge of the appropriate sections of the Kinetics Seismic and/or Pipe and Duct manuals (as appropriate) or copies of those sections that can be used for reference.

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Toll Free (USA Only): 800-959-1229
International: 614-889-0480
FAX: 614-889-0540
World Wide Web: www.kineticsnoise.com
E-mail: sales@kineticsnoise.com

SECTION – A1.1

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VIBRATION ISOLATION & SEISMIC CONTROL
MANUFACTURERS ASSOCIATION

INSPECTING DISTRIBUTION SYSTEMS

A1.2.1 Scope:

When inspecting Distribution Systems (Pipe, Duct, Conduit, etc) in the field, it is important to maintain an awareness of the scope of the Kinetics Noise Control's (KNC) Certification and recognize that KNC must limit comments and observations as much as possible to the confines of that scope. It is a regular occurrence in the field for the installation contractors to ask KNC representatives to offer comments and even make decisions for items that KNC as a design team may have nothing to do with. It is also common to be asked to discuss aspects of equipment beyond the bounds of the actual restraint connection. An example might have to do with the durability of a contractor designed support bracket or the ability of a masonry wall to resist the design forces. These components would be beyond KNC's control and must be referred to the Structural Engineer of Record. In order to offer any design input or guidance on items such as this implies that whoever is offering that input fully understands all of the loads being carried by the item, what it's total capacity might be and is willing to take responsibility for that knowledge.

KNC's involvement in a project is legally limited to those components provided by KNC. The scope is therefore limited to those issues related to the proper selection and installation of those pieces of hardware that restrain the distribution system to the structure. It includes the anchors or bolts that connect the restraint to the structure, the restraint components provided by KNC and the attachment of the restraint to the piping, ductwork or conduit. With the exception of generic A307 hardware with industry standard ratings, any non-KNC component provided by others would be outside of KNC's ability to offer any binding recommendation or certification.

The scope also does not include an evaluation of the building structure and its ability to resist the loads applied to it. Only the engineer of record for that structure can state categorically that the structure is capable of resisting the design loads.

Further, KNC must limit the scope of the inspection to only those objects that can be seen. KNC cannot offer any positive comments on attachments or components that are hidden from view.

It is recommended that the Installation Contractor inspect his own equipment using this checklist prior to having the equipment inspected by an external organization. This will allow corrections to be made prior to an official inspection and will make it much more likely that the inspection will be passed successfully.

Special Note: *As rod stiffener requirements cannot be fully evaluated until specific site conditions are known, they are not designed and specified by KNC except under special circumstances. Section D4.4 of this manual includes a "tool" that allows contractors to determine specific requirements for this purpose. Should the contractor wish for KNC to take responsibility for the sizing and installation of these components, it will be necessary to collect data in the field, process it and generate a report for each restraint location. In the field, 5 minutes should be allowed to*

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collect the data at each point and then later in the office, 5 minutes should be assumed to process the data at each point to generate a report.

A1.2.2 Setup

- 1) Prior to performing an inspection, obtain a full set of drawings for the distribution system being inspected and label each restraint location with a reference number. For convenience, it is best for this to be an 11 x 17 drawing, but if this is too small to be clear, a larger copy will work.
- 2) Print off several copies of the checklist that is provided as the last sheet of this document to use for records.
- 3) Print off a copy of section D4.4 of this manual which provides guidance as to when rod stiffeners are required

A1.2.3 Inspection Process

- 1) In the field, locate each restraint location documented on the installation drawing and on a copy of the checklist, identify it by drawing number and reference number.
- 2) Using the check boxes and additional comments box provided for each location on the checklist, identify the condition of the restraint as you found it. Should corrective action be taken to correct a deficiency, a notation should be included in the additional comments box that the situation was corrected.
- 3) Should a deficiency be identified that is not listed on the checklist, describe it in the additional comments box.
- 4) Should additional areas exist that warrant comment (such as re-routed piping), additional tags can be added to the inspection drawing in the field and linked to the inspection document.
- 5) Copies of both the inspection checklists and the marked inspection drawings should be provided to KNC for records.
- 6) For clarity, it may be desirable to take photographs of some of the restraint locations, link them by tag number to the drawing and provide them to KNC for records as well. This is highly recommended for unusual installation arrangements.

A1.2.4 Items to be inspected:

- 1) Basic Geometry (as compared to the certification documents)
 - a) Check restraint type, size and approximate location as compared to the drawing callouts.
 - b) Check that 4 way restraints are provided at the locations marked "TL" or "TT" on the submitted installation documents and that "L" restraints are aligned to prevent axial motion of the system and "T" restraints are aligned to prevent transverse motion of the system.
 - c) Where the system design has changed and restrained systems have been rerouted or eliminated, identify these on the drawing including the re-routing path and include restraint locations compatible with the relocated system.
 - d) Where the distribution system has been covered and is not accessible, indicate on the inspection documents that these locations cannot be verified.

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2) Exemptions

- a) If a Restraint has been eliminated due to an exemption condition (most likely the 12" rule), ensure that all other required factors apply (Free swinging connector, adequate swing clearance, adequate flex at equipment attachment points, no mismatched [over 12" long supports] on the run.)

3) Restraint Factors

- a) Verify that the Cable angles relative to the horizontal plane are consistent with the documentation provided (Note: in general this permits a maximum 60 deg angle from the horizontal plane for the cables, but in some cases may limit the angle to 45 deg. This limit would be identified on the project specific tabulated restraint sizing charts (listing the bubble codes)).
- b) Verify that the Cable angles relative to one another as viewed in the plan view are within 10 degrees of being aligned.
- c) Visually inspect the hardware used for size compliance versus the drawing callout.
- d) Cables must be installed in a snug (non-isolated) or near snug (isolated) condition.

4) Structural Attachment Factors

- a) Ensure that the connections to the structure are aligned with the restraint cables.
- b) If a KSCA clip is used, that a single anchor is located in the hole closest to the cable end.
- c) Compare the connection viewed in the field to an arrangement drawing representative of the connection specified on the drawing. A pictorial representation is present on the restraint cover sheet generated by KNC.
- d) Ensure that restraint connections are made using KNC provided hardware. Connections made without KNC hardware have not been tested and ratings cannot be verified.
- e) Check that attachments made via beam clamps are positive and that beam clamps are equipped with straps of sufficient capacity to ensure that the beam clamps cannot be pulled off the beam by lateral forces.

5) Component Attachment Factors

- a) Ensure that the connections to the component will positively prevent relative motion between the component and the restraint. (ie: clevis support hangers cannot be used in conjunction with Longitudinal (L) restraints and ductwork must also be adequately screwed to support trapeze bars to resist Longitudinal (L) forces.)
- b) Transverse and/or Longitudinal restraints must connect to the distribution system within 4 inches of a support point.

6) Hanger Rod Issues

- a) Ensure that Hanger rod is made of a material that can resist uplift forces (Rod or structure shape, not cable or sheet metal strap)
- b) If the system is isolated, check that the isolator brackets are within ¼" of the support structure and that they are fitted with limit stops that prevent the hanger rods from pushing up more than ¼" into the housing.
- c) Refer to this manual, Section D4.4 to determine if Rod Stiffeners are required and for sizing purposes.

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VIBRATION ISOLATION & SEISMIC CONTROL
MANUFACTURERS ASSOCIATION

INSPECTING EQUIPMENT

A1.3.1 Scope:

When inspecting equipment in the field, it is important to maintain an awareness of the scope of the Kinetics Noise Control's (KNC) Certification and recognize that KNC must limit comments and observations as much as possible to the confines of that scope. It is a regular occurrence in the field for the installation contractors to ask KNC representatives to offer comments and even make decisions for items that we have nothing to do with. It is also common to be asked to discuss aspects of equipment beyond the bounds of the actual restraint connection. An example might have to do with the durability of an equipment stand or a masonry wall. These components would be beyond KNC's control and must be referred to the Structural Engineer of Record. In order to offer any design input or guidance on items such as this implies that whoever is offering that input fully understands all of the loads being carried by the item, what it's total capacity might be and is willing to take responsibility for that knowledge.

KNC's scope is limited to those issues related to the direct attachment of the equipment to the structure. It includes the anchorage to the structure, the restraint component and the attachment of the restraint to the equipment. In some cases, it may include other KNC provided items like Inertia Bases, Structural frames or beams. All of these items, when provided by KNC, would fall into KNC's scope. If provided by others, they would not and legally KNC could not offer guidance or input on them.

The scope also does not include an evaluation of the building structure and its ability to resist the loads applied to it. Only the engineer of record for that structure can state categorically that the structure is capable of resisting the design loads.

Further, KNC must limit the scope of the inspection to only those objects that can be seen. KNC cannot offer any positive comments on attachments or components that are hidden from view.

It is recommended that the Installation Contractor inspect his own equipment using this checklist prior to having the equipment inspected by an external organization. This will allow corrections to be made prior to an official inspection and will make it much more likely that the inspection will be passed successfully.

A1.3.2 Items to be inspected:

- 1) Basic Geometry (as compared to the certification documents)
 - a) Approximate overall mounting dimensions (this is particularly true for equipment that might not be provided with "built in" mounting holes and instead, clips like the KSMS have been fitted or holes were drilled for mounting by the contractor). Verify that the spacing between the restraints and the quantity of restraints used combine to generate an arrangement that is at least as good as that specified in the certification document. (Increasing the restraint quantity or spacing is good, decreased restraint quantity or spacing is not.)

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- b) Verify that the overall dimensions of the equipment appear to be in line with what has been analyzed. This does not need to be measured critically, a simple approximation is adequate.
- 2) Bolts, welds or anchors that attach to the structure.
- a) Verify that the anchors or bolts are at least as large as those identified in the certification document.
 - b) To the extent possible, check that the holes for these attachment points are not to be more than 1/8" in diameter larger than the bolt body.
 - c) If anchored to concrete, check that the edge distance and spacing meets the minimum requirements called out on the certification document.
 - d) Check that the anchors are installed at 90 degrees to the parent slab (vertical for floor mounted equipment) and are not canted at an angle.
 - e) If welded, verify that the welds are in conformance with those shown on the certification document.
- 3) Restraint component.
- a) If an oversized base plate is shown as being required by the certification document, verify that the appropriate sized base plate has been fitted.
 - b) Check that the internal clearances in the snubbing element do not sum to more than 1/2" in any axis (ie: since 1/4" movement is allowed in any direction, this can show up as 1/4" on each side of the snubbing element or as 1/8" on one side and 3/8" on the other. This is particularly critical for isolators like the FLS, FLSS and HS-1 where the installer controls the spacing.)
 - c) Ensure that all restraints called for are properly in place (particularly true for curb mounted equipment like KSR's)
- 4) Bolts/welds that attach to the equipment.
- a) Verify that the restraint is attached to the equipment using all of the provided attachment holes in the restraint or a weld equivalent to that identified on the certification document.
 - b) Check that curb mounted equipment is positively connected to the curb or curb isolation system.
- 5) Suspended equipment
- a) Compare the installation to the certification document and ensure that if required, rod stiffeners have been fitted.
 - b) If the component is supported by only 2 hanger rods, check that the restraints are attached to it at its approximate CG.
 - c) Visually check that the cable angles are no steeper than 60 degrees from the horizontal plane.
 - d) Visually check that cables do not have excessive slack (they are to be snug, but not tensioned).
 - e) Visually check that cables are oriented approx 90 degrees apart when viewed looking straight up from the floor.

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- f) Visually check that cables are straight and are not contacting or distorted by an intermediate obstruction.
- g) If the system is isolated, check that the isolator brackets are within ¼” of the support structure and that they are fitted with limit stops that prevent the hanger rods from pushing up more than ¼” into the housing.

6) Documentation

- a) Complete the Inspection Checklist for each piece of equipment indicating the observed installed equipment condition and note any discrepancies.
- b) In performing this inspection, identify the condition of the piece of equipment as you found it. Should corrective action be taken to correct a deficiency, A notation should be included in the additional comments box of the checklist indicating that the situation was corrected.
- c) Retain the installation Inspection Checklist for records
- d) Where appropriate, photos should be taken, linked to tags and retained for records as well.

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