

**Jeff Miller - RE: Draft 2013 Appendix NA2 attached for review - NonResidentialAir Distribution Systems Leakage Testing**

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**From:** Glenn Friedman <GFriedman@taylor-engineering.com>  
**To:** Jeff Miller <jmiller@energy.ca.gov>, Craig Wray <cpwray@lbl.gov>, JimHussey <JHussey@marinam.com>, JohnProctor <john@proctoreng.com>, EliHoward <ehoward@smacna.org>, Mark Modera <mpmodera@ucdavis.edu>, "eemblem@wscsmw.net" <eemblem@wscsmw.net>  
**Date:** 1/26/2012 11:57 AM  
**Subject:** RE: Draft 2013 Appendix NA2 attached for review - NonResidentialAir Distribution Systems Leakage Testing  
**CC:** Gary Flamm <gflamm@energy.ca.gov>, Martha Brook <Mbrook@energy.ca.gov>, Maziar Shirakh <Mshirakh@energy.ca.gov>, Glenn Friedman <GFriedman@taylor-engineering.com>

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Dear Jeff:

Thank you for taking my comments and implementing changes. It feels good to know I can contribute to an improved result. Below, please see answers to your questions.

BTW, keep in mind that ASHRAE 193 does apply to most boxes that move less than 3,000 CFM but it does not apply to VAV boxes.

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**From:** Jeff Miller [mailto:Jmiller@energy.ca.gov]  
**Sent:** Tuesday, January 24, 2012 9:42 PM  
**To:** Craig Wray; JimHussey; JohnProctor; Eli Howard; Glenn Friedman; Mark Modera; eemblem@wscsmw.net  
**Cc:** Gary Flamm; Martha Brook; Maziar Shirakh  
**Subject:** RE: Draft 2013 Appendix NA2 attached for review - Non ResidentialAir Distribution Systems Leakage Testing

Glen,

Thank you for these comments. Here are followup responses/questions. I have attached a revised version consistent with the responses below.

<<2013 NA2 - Ducts -45day20120124insp.doc>>

Air handler leakage (addresses your items :

This NA2 duct leakage protocol is patterned after the residential methods (as I understand it). The air handler is considered part of the total duct system for purposes of determining the leakage rate for both new and existing systems. There are no requirements for temporary sealing of the air handler for the test, except that nonresidential air handlers with OA dampers/economizers shall have those dampers/economizers taped off (temporarily). The difference between the compliance scenarios for new vs existing ducts is the "best that I can do" scenario for altered ducts in NA2.1.4.2.2 Sealing of all Accessible Leaks that does not require sealing the leaks found in the air handler during the smoke test. My understanding is that the reason for not specifying permanent sealing of all the leaks found in the air handler during the smoke test is that the manufacturer's may prohibit that sealing for safety reasons or it may damage the equipment or void the equipment warranty.

response to your items 1(a) and 1(b): yes it seems reasonable that we could specify sealing of access doors and cabinet penetrations consistent with the inspection criteria in NA2.1.4.2.4. made the change.

response to 1(c): air handler is included for both new and for existing duct systems.

response to 1(d): triggers for requirements for new and for existing ducts are given in Standards (see attached draft 141.0 section 141.0(b) 1D).

<<2013 149 NR Additions Alterations Repairs -45day20120123insp.doc>>

response to 2: correct. there is no direction given for permanent sealing of air handler seams and penetrations (with mastic). Also see question below.

response to 2(e) Question: in your experience, is it true that manufacturers would not allow permanent sealing of some non-access seams and penetrations for their equipment?*[Glenn Friedman]* Yes.

response to 2(f): have added sealing requirements to NA2.1.4.2.1 step 1. and the visual inspection in NA2.1.4.2.4 already requires verification of that sealing.

response to 3: Sealing of all accessible leaks does not require meeting any specific leakage rate criterion, it is just "the best that I can do", so sealing the air handler is irrelevant even though the air handler is considered part of the duct system for the test. It is only a requirement to seal the leaks noticed during the smoke test that are "accessible" and are not coming from the air handler.

response to 4: agree with the comment and have added sealing requirements to NA2.1.4.2.1 step 1.

response to 5: we have defined air handling unit as follows which was consistent with definitions used elsewhere (e.g. CMC CH2) We use this term to refer to furnaces and heat pumps, and package units, etc.:

AIR-HANDLING UNIT or AIR HANDLER is a blower or fan that distributes supply air to a room, space, or area.

Question: now that we have ASHRAE 193, and have in place a compliance credit for residential Low Leakage Air-Handling Units, and since 193 covers equipment up to 3,000 cfm, do you think we should be looking ahead to providing credits to encourage low leakage air-handling units for small commercial installations? Note we have drafted JA9 that specifies qualifications for Low Leakage Air-Handling Units and welcome your review and comments: *[Glenn Friedman]* Yes, I encourage an incentive for low leakage units that are tested in accordance with ASHRAE 193.

[http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Draft\\_Language/Staff\\_Proposed\\_Draft\\_Language-Appendices/2013\\_JA\\_9-Low\\_Leakage\\_Air-Handling\\_Units-45day.pdf](http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Draft_Language/Staff_Proposed_Draft_Language-Appendices/2013_JA_9-Low_Leakage_Air-Handling_Units-45day.pdf)

Thanks again for your really helpful review and comments.

jeff

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**To:** Jeff Miller <[Jmiller@energy.state.ca.us](mailto:Jmiller@energy.state.ca.us)>, Craig Wray <[cpwray@lbl.gov](mailto:cpwray@lbl.gov)>, JimHussey <[JHussey@marinam.com](mailto:JHussey@marinam.com)>, JohnProctor <[john@proctoreng.com](mailto:john@proctoreng.com)>, Eli Howard <[ehoward@smacna.org](mailto:ehoward@smacna.org)>, Mark Modera <[mpmodera@ucdavis.edu](mailto:mpmodera@ucdavis.edu)>, "eemblem@wscsmw.net" <[eemblem@wscsmw.net](mailto:eemblem@wscsmw.net)>  
**CC:** Gary Flamm <[gflamm@energy.state.ca.us](mailto:gflamm@energy.state.ca.us)>, Martha Brook <[Mbrook@energy.state.ca.us](mailto:Mbrook@energy.state.ca.us)>, Maziar Shirakh <[Mshirakh@energy.state.ca.us](mailto:Mshirakh@energy.state.ca.us)>, Glenn Friedman <[GFriedman@taylor-engineering.com](mailto:GFriedman@taylor-engineering.com)>  
**Date:** 1/10/2012 5:52 PM  
**Subject:** RE: Draft 2013 Appendix NA2 attached for review - Non ResidentialAir Distribution Systems Leakage Testing

Dear Jeff:

We reviewed the draft of the 2013 update to Title 24, Part 6, Nonresidential Appendix NA2 duct leakage measurement protocol and have the following comment:

1. NA2.1.4.2.1 Diagnostic Duct Leakage from Fan Pressurization of Ducts, paragraph 1. indicates the air handling unit is to be included in the test.
  - a. There is no criteria for sealing the access doors. Presumably temporary sealing the access doors is not allowed. Consider explicitly stating this.
  - b. There is no criteria for sealing the cabinet penetrations. Presumably temporary sealing the cabinet penetrations is not allowed. Consider explicitly stating this.
  - c. Why is the air handling unit cabinet included for new duct systems only and not for existing systems?
  - d. What defines "altered ducts" that trigger this section to be applicable to an existing system?
2. NA2.1.4.2.2 Sealing of All Accessible Leaks paragraph 2. addresses ducts. There is no direction regarding leaks in the air handling unit's cabinet.
  - e. Consider allowing sealing on non-access openings.
  - f. Consider limiting the sealing of access openings to seal types that can be reused and allow access such as gaskets.
3. NA2.1.4.2.3 Smoke-Test of Accessible-Duct Sealing, paragraph 3., bullet item 2 allows ignoring smoke leakage from the furnace cabinet which is gasketed and sealed by the manufacturer. This seems to contradict the intent of NA2.1.4.2.1 paragraph 1. that the air handling unit is to be included in the test. If this is supposed to be different than NA2.1.2.1 then consider allowing the cabinet to be excluded from the test by temporarily sealing the blower unit and accessory cabinets completely.
4. NA2.1.4.2.4 Visual Inspection of Accessible Duct Sealing, paragraph 3. Indicates access panels may be sealed. This seems to contradict the intent of NA2.1.4.2.1 paragraph 1. that the air handling unit is to be included in the test. If this is supposed to be different than NA2.1.2.1 then consider allowing the cabinet to be excluded from the test by temporarily sealing the blower unit and accessory cabinets completely.
5. The term air handling unit and furnace are used interchangeably. Consider using a term such as blower unit to cover all cabinets with fans such as furnaces, packaged units, heat pumps, fan coils and air handling units.

We do not know why the smoke test was excluded from the 2005 Standard.

Glenn Friedman, P.E.

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**From:** Jeff Miller [<mailto:Jmiller@energy.state.ca.us>]

**Sent:** Wednesday, December 28, 2011 3:57 PM

**To:** Craig Wray; Jim Hussey; JohnProctor; Eli Howard; Glenn Friedman; Mark Modera; [eemblem@wscsmw.net](mailto:eemblem@wscsmw.net)

**Cc:** Gary Flamm; Martha Brook; Maziar Shirakh

**Subject:** Draft 2013 Appendix NA2 attached for review - Non Residential Air Distribution Systems Leakage Testing

Attached for your review is our proposed draft for the 2013 update to Title 24, Part6, Nonresidential Appendix NA2 duct leakage measurement protocol. <<2013 NA2 - Ducts -45day20111227insp.doc>> A pdf version will be posted for public review shortly.

Also attached is a draft CASE report (from archives) from the update for the 2005 Standards that proposed a smoke test for existing systems when they could not pass the standard duct leakage test. <<2003-01-21\_EXIST\_DUCT-Light-Comm-Bldg\_.pdf>>

We do not seem to have a record of the reason why the smoke test did not appear in the 2005 Standards version of the nonresidential duct leakage test protocol even though the smoke test was recommended by this draft CASE report, so would appreciate any feedback or advice any of you could provide.

Note in the attached draft of NA2 we have inserted a smoke test protocol that is consistent with the residential smoke test protocol for "sealing of all accessible leaks" for existing duct systems. We deleted the visual inspection of "excessively damaged" ducts. Also there is a lot of legacy ACM language deleted.

If possible, please reply with your comments, corrections, recommendations, concerns during the first week or two of January 2012.

thanks.

jeff

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<b>From:</b>	Erik Emblem < <a href="mailto:eemblem@jceep.net">eemblem@jceep.net</a> >
<b>To:</b>	<a href="mailto:Jmiller@energy.state.ca.us">Jmiller@energy.state.ca.us</a> ; <a href="mailto:eemblem@wscsmw.net">eemblem@wscsmw.net</a>

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<b>Date:</b>	5/11/2011 3:54 PM
<b>Subject:</b>	Re: RE: Round Table Invitation: Non Residential Air Distribution Systems Leakage Testing

Jeff

We do not have a specific suggestion to change the current duct testing requirements as are set forth in the Standards at this time. We are hoping that our work with Craig Wray and his PIER project will reveal a cost effective method of determining acceptable system performance, at that time we will collaborate with CEC to amend the current requirement for testing all non residential HVAC systems including duct. I realize you are on a time schedule to get your 45 day language out, thank you for keeping us in the loop.

Sincerely,

Erik S Emblem

Executive Administrator

Joint Committee on Energy and Environmental Policy

On Wed, May 11, 2011 at 10:40 AM, Jeff Miller <[Jmiller@energy.state.ca.us](mailto:Jmiller@energy.state.ca.us)> wrote:

I wanted to acknowledge this string that discussed the measurement of duct surface area. These duct surface area considerations are applicable to the methods that the performance compliance software utilizes to determine energy budgets, thus the surface area information is not properly located in this duct leakage measurement appendix that applies only to small constant volume systems. I believe this duct surface area information should be moved to the Alternative Calculation Method (ACM) manual. This NA2 protocol determines total duct system leakage by pressurization methods, and determines compliance criteria based on the nominal system rated capacity, not based on the surface area of the duct system.

Thank you for providing these comments.

jeff

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<b>From:</b>	Glenn Friedman < <a href="mailto:GFriedman@taylor-engineering.com">GFriedman@taylor-engineering.com</a> >
<b>To:</b>	"Howard, Eli" < <a href="mailto:ehoward@smacna.org">ehoward@smacna.org</a> >, Jeff Miller < <a href="mailto:Jmiller@energy.state.ca.us">Jmiller@energy.state.ca.us</a> >, "Erik Emblem" < <a href="mailto:eeemblem@aol.com">eeemblem@aol.com</a> >, Craig Wray < <a href="mailto:cpwray@lbl.gov">cpwray@lbl.gov</a> >, Jim Hussey < <a href="mailto:JHussey@marinam.com">JHussey@marinam.com</a> >, John Proctor < <a href="mailto:john@proctoreng.com">john@proctoreng.com</a> >, Mark Modera < <a href="mailto:mpmodera@ucdavis.edu">mpmodera@ucdavis.edu</a> >
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<b>Date:</b>	5/7/2011 5:01 PM
<b>Subject:</b>	RE: RE: Round Table Invitation: Non Residential Air DistributionSystems Leakage Testing

We are in agreement that it is the metal ID. Thanks.

20" x 20" duct with 1" liner is 22" x 22" metal so use the 22" x 22" dimension, not the 20" x 20" dimension.

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**From:** Howard, Eli [mailto:[ehoward@smacna.org](mailto:ehoward@smacna.org)]  
**Sent:** Saturday, May 07, 2011 4:57 PM

**To:** Glenn Friedman; Jeff Miller; Erik Emblem; Craig Wray; Jim Hussey; John Proctor; Mark Modera  
**Cc:** Martha Brook; Maziar Shirakh  
**Subject:** RE: RE: Round Table Invitation: Non Residential Air Distribution Systems Leakage Testing

Glenn,

Not really as even with liner the actual gasket material cover the entire flange so it actually protrudes a bit inside the ductwork and on the corners a very common practice is to fold the gasket material to cover the minor notch that occurs in the rolled form or slip-on transverse joint. As the liner is within the ductwork would you measure the inside of the liner, I doubt so I would recommend the ID of the sheet metal. I'll get a few samples together and send our as a PDF for discussion....

Thanks for your feedback on a Saturday night for me☺....

Eli

**From:** Glenn Friedman [mailto:[GFriedman@taylor-engineering.com](mailto:GFriedman@taylor-engineering.com)]  
**Sent:** Saturday, May 07, 2011 7:51 PM  
**To:** Howard, Eli; Jeff Miller; Erik Emblem; Craig Wray; Jim Hussey; John Proctor; Mark Modera  
**Cc:** Martha Brook; Maziar Shirakh; Glenn Friedman  
**Subject:** RE: RE: Round Table Invitation: Non Residential Air Distribution Systems Leakage Testing

Dear Eli:

I am not in agreement for a rectangular lined duct. The ID is the duct liner and the OD is the metal duct where the sealing takes place and is he air barrier.

Are we thinking about different things? Maybe some details might help.

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**From:** Howard, Eli [mailto:[ehoward@smacna.org](mailto:ehoward@smacna.org)]  
**Sent:** Saturday, May 07, 2011 4:48 PM  
**To:** Glenn Friedman; Jeff Miller; Erik Emblem; Craig Wray; Jim Hussey; John Proctor; Mark Modera  
**Cc:** Martha Brook; Maziar Shirakh  
**Subject:** RE: RE: Round Table Invitation: Non Residential Air Distribution Systems Leakage Testing

Actually in Non Residential that method wouldn't apply, as most transverse joint connections for rectangular ductwork exceeding 36" would typically fall into a rolled formed joint (TDC, TDF) or a slip-on flange system (Ductmate, Ward, etc.) in which a gasket is used within the joint to provide the seal, so minimal if any sealant would be applied to the exterior of the joints.

I'd be more than happy to send some details of this construction method as it's been pretty common for commercial systems since the mid 90's....

Thanks,

Eli

**From:** Glenn Friedman [mailto:[GFriedman@taylor-engineering.com](mailto:GFriedman@taylor-engineering.com)]  
**Sent:** Saturday, May 07, 2011 5:01 PM  
**To:** Jeff Miller; Erik Emblem; Craig Wray; Jim Hussey; John Proctor; Howard, Eli; Mark Modera  
**Cc:** Martha Brook; Maziar Shirakh; Glenn Friedman  
**Subject:** RE: RE: Round Table Invitation: Non Residential Air Distribution Systems Leakage Testing

Dear Jeff:

Consider changing the measured perimeter of rectangular ducts as the outside dimensions since that is the true location of the duct sealing.

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**From:** Jeff Miller [\[mailto:Jmiller@energy.state.ca.us\]](mailto:Jmiller@energy.state.ca.us)

**Sent:** Wednesday, May 04, 2011 12:17 PM

**To:** Erik Emblem; Craig Wray; Jim Hussey; John Proctor; Eli Howard; Glenn Friedman; Mark Modera

**Cc:** Martha Brook; Maziar Shirakh

**Subject:** Fwd: RE: Round Table Invitation: Non Residential Air Distribution Systems Leakage Testing

Attached is a word doc file version of the 2008 Nonresidential Appendix NA2 that could be used for communicating any suggestions for improvements to the Nonresidential Air Distribution Diagnostic Measurement and Field Verification protocol. It works well if the changes are given using the "track changes" utility in Word. Send comments to me or to Mazi.

Thanks in advance for your participation in our Standards update process.

Feel free to call or write if you want to discuss this topic further.

jeff

Jeff Miller

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