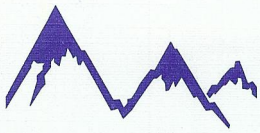


International Isotopes Inc.

February 20, 2009

Mr. Rick Boyle

U.S. Department of Transportation
Office of Hazardous Materials Technology
PHH-23 Radioactive Materials
1200 New Jersey Ave., SE East Building, 2nd Floor
Washington, D.C. 20590-0001

Subject: Response to Request for Additional Information as Discussed during the January 27, 2009 Conference Call in Regards to Revalidation of the Model No. 1860 A Package Revalidate AUS/2007-13/B(U)-96

Dear Mr. Boyle,

A conference call to address additional comments from the US Nuclear Regulatory Commission was conducted on January 27, 2009. Representatives from the US NRC, US Department of Transportation, International Isotopes, Inc. and Analogue & Digital Measurements (A&DM) participated in the call.

Mr. Parrott from A&DM provided a letter and supplemental documentation intended to address the items discussed during the conference call, copy of mail containing these concerns is attached.

Two thermal questions, RAI 2-3 and RAI 2-4 are addressed in A&DM letter paragraph **Heat Test Oven TSR-1 728(a)** which provides a description of the oven. Supplemental documentation includes a copy of an email written by Mr. William Townsend, Australian Nuclear Science and Technology Organization (ANSTO) which further describes the thermal test as well as the fin analysis. A copy of the temperature analysis conducted by Mr. Townsend is also provided.

In addition, a video of the actual package testing is available on the web at:
http://www.nuclearaustralia.com.au/info_cask3.html#select

There were several Shielding related RAIs that required additional response. Some of these were addressed during the conference call, particularly the issue regarding Ra-226. The request to authorize the container to transport Ra-226 had been rescinded. Additional shielding questions

4137 Commerce Circle, Idaho Falls, Idaho 83401
Phone: 208-524-5300, 800-699-3108 Fax: 208-524-1411
Website: www.intisoid.com

the allowable activity in the cask configurations to coincide with the activity that would result in a transport index of less than 10 based on the NRC models. A&DM reiterates this position in the Maximum Activity section of Mr. Parrott's letter. Mr. Parrott also notes that an 1860 cask in Configuration C will be loaded with 10,000 Ci and actual measurements will be obtained to validate the design and attenuation coefficients. This information will be forwarded to the DOT and NRC when it is obtained.

Mr. Parrott addressed the question regarding the appropriate surface to be used to obtain the transport index (T.I.) measurement. The NRC suggests the end caps since the crumple shield does not cover the end cap. Mr. Parrott contends in his letter that the T.I. as measured from the crumple shield is valid in that it is only possible to reach this area with the hands and therefore does not pose an elevated risk to body exposure. I agree with Mr. Parrott's argument in that the T.I. should be measured 1 meter from the surface of a package that is accessible to the whole body. The following paragraphs from Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, IAEA Safety Guide TS-G-1.1 (Rev. 1) 2008 support this reasoning:

526.1. The TI is an indicator of the radiation level in the vicinity of a package, overpack, tank, freight container, conveyance, unpackaged LSA-I or unpackaged SCO-I and it is used in the provision of radiation protection measures during transport.

526.4. Where there are protrusions on the exterior surface, the protrusion should be ignored in determining the 1 m distance, except in the case of a finned package, in which case the measurement may be made at 1 m distance from the external envelope of the package.

General questions were raised regarding source drawer configurations. Mr. Parrott provided a response to these comments in the AD&M letter, including round and square drawer and cavity dimensions and tolerances, a list of approved source drawers for specific devices, and methods to fix the position of the source capsule within the source drawer. Language similar to that found in Certificate of Compliance Docket Number 71-9215, Paragraph 7 which reads: *The contents must be secured in the drum assembly so as to restrict movement in any direction to less than 0.25 inch, by lead, steel, or tungsten full diameter plugs and spacers*, would be appropriate for use in the 1860 revalidation to describe the positioning of the source within the source drawer. Clarification of configuration D was addressed during the call, the NRC's comment regarding the authorized contents, i.e. pencils is accurate.

the 1860 revalidation to describe the positioning of the source within the source drawer. Clarification of configuration D was addressed during the call, the NRC's comment regarding the authorized contents, i.e. pencils is accurate.

Issues regarding the End Crumple Shield and TSR-1 drop test are addressed in the A&DM letter paragraph End Crumple Shield. A&DM provides suggested modifications that could be completed without interfering with the design of the cask to cover the access tube.

The A&DM letter revised Table 60 of the SAR to cross reference the listings to the relevant table or text.

Finally Drawing No. 1860A-D1-105-00 has been provided/

Should you have any questions, or need additional documentation please contact me by phone at (208) 524-5300 or by email at jjmiller@intisoid.com

Sincerely,

John J. Miller, CHP
International Isotopes Inc.
4137 Commerce Circle
Idaho Falls, ID 83401

JJM-2009-09

cc
Chris Staab, Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards

John J. Miller

From: Christopher Staab [Christopher.Staab@nrc.gov]
Sent: Monday, January 26, 2009 6:26 AM
To: John J. Miller; Michael.Conroy@dot.gov
Subject: RE: Request: Phone Call to Discuss Following RAI Responses and Suitable Path Forward:

2pm tommorrow works for us.

-----Original Message-----
From: John J. Miller [mailto:jjmiller@intisoid.com]
Sent: Friday, January 23, 2009 10:49 AM
To: Michael.Conroy@dot.gov; Christopher Staab
Cc: 'Ted Parrott'; kieren@eqss.com.au; 'Steve Laflin'
Subject: RE: Request: Phone Call to Discuss Following RAI Responses and Suitable Path Forward:

I would like to set-up a conference call to discuss the remaining comments.
Please confirm your availability, if unable to make the scheduled call propose a new date.
Keep in mind we are spanning many time zones so 2:00 PM Eastern Time is the best.

Conference Call:

USA Date/Time: January 27, 2009 2:00 PM Eastern Time
Australian Date/Time: January 28, 2009 8:00 AM Melbourne Time

Call in number:

(Country Code 0011) 1-888-447-7153

Participant # 6445970

John

-----Original Message-----
From: Michael.Conroy@dot.gov [mailto:Michael.Conroy@dot.gov]
Sent: Friday, January 16, 2009 8:17 AM
To: Christopher.Staab@nrc.gov; jjmiller@intisoid.com
Subject: RE: Request: Phone Call to Discuss Following RAI Responses and Suitable Path Forward:

I am out of the office until Wednesday.
John- let me know when you'd like to schedule this.

From: Christopher Staab [mailto:Christopher.Staab@nrc.gov]
Sent: Fri 1/16/2009 10:02 AM
To: Conroy, Michael <PHMSA>; John J. Miller
Subject: Request: Phone Call to Discuss Following RAI Responses and Suitable Path Forward:

Mike and John,

The statement in the response cover letter from A&DM: "To make the changes to our document to suit your regulators will require a resubmission to ARPANSA, this is a headache that we do not want" is an invalid reason to not respond to U.S. NRC questions on analyses, if the package is to be used for U.S. import or export. A&DM may choose to supplement the SAR to satisfy NRC requirements independent from ARPANSA interactions. The following issues require resolution for the U.S.
NRC to revalidate the packaging. We recommend a phone call to discuss an appropriate path forward:

"Thermal:

For RAI 2-3, how will the test oven produce the environment described in S-T-2, Paragraph 728.8:

728.8. The 1985 edition of the Regulations removed the previous ambiguity of "convection heat input in still ambient air at 800°C" but did not specify a value for the coefficient, requiring the designer to justify the assumptions. A significant proportion of the heat input may derive from convection, particularly when the outer surface is finned and early in the test when the surfaces are relatively cool. The convective heat input should be at least equivalent to that for a hydrocarbon fuel air fire at the specified conditions.

For RAI 2-4, you should consider radiation in your analysis, otherwise there is a potential for your package surface temeprature to increase.

Shielding:

1.1 Based upon the applicant's desire to use this as a non-exclusive use package and the lack of information regarding certain parts of the shielding configuration and calculations' bases as well as based upon staff dose calculations for the package (as described in the technical drawings) and the proposed contents showing dose rates that exceed the non-exclusive use limits, the NRC may, with the attachment of necessary conditions to the approval, recommend reduced content limits for non-exclusive use transport.
Any contents that exceed these staff-derived limits, but still meet the Approval Certificate limits, would need to be shipped as exclusive-use. The content limits for non-exclusive use

transport and the requirement to ship contents in excess of the limits as exclusive use would become conditions for revalidation. The calculation work would still need to be done to determine the contents limits.

At this point in time, it appears that only the Cobalt-60 (Co-60) and Radium-226 (Ra-226) sources are of concern. The Ra-226 is a problem due, at least in part, to the presence of decay daughters; these do not appear to have been accounted for in the applicant's analyses. The daughters need to be considered since the source is special form. The discrepancy in dose rates also appears to arise from the use of additional shielding material than the technical drawings show to exist in the package. For example, the dose rate calculation for package Configuration A, which has lead-only shielding, uses 200mm of lead; the technical drawings indicate that there is only 189.5mm of lead. This is a small thickness, but enough to see the dose rate (Transport Index) nearly double. Not knowing anything about the source drawer (its shielding configuration and its ability to keep the source centered in the package) requires certain assumptions to be made which in turn may need to be stipulated as conditions of revalidation. Lastly, there is a question as to the package surface for defining distances and application of dose rate limits. The TS-R-1 regulations state that the the dose rate at any point on the package surface should be less than 2mSv/hr and the TI at 1 meter from the surface be 10 or less for non-exclusive use. At the ends of the package, the surface of the package is at the end caps of the attenuator case since the crumple shell does not cover this area on either end of the package.

1.2 TS-R-1 explicitly states in Paragraph 501(b) that: "For each Type B(U), Type B(M) and Type C package ... it shall be ensured that the effectiveness of its shielding ... are within the limits applicable to or specified for the approved design." This means, that each fabricated package must be able to contain the maximum approved contents as set forth in the Approval Certificate for that design. If it cannot do this, it is a defective package that cannot be used. NRC agrees this would require a change to the SAR, since this affects two sections in the SAR that deal with this operation/acceptance test. This is resolved by placing a condition on the revalidation that the shielding of fabricated packages shall be, prior to first use, shown to be effective for the maximum allowed contents (that for non-exclusive use, the package can meet the contents limit set in the conditions for revalidation or set in the Approval Certificate, whichever are applicable for non-exclusive use) for the applicable package configuration using the procedure on page 237 of 276 of the application. Packages that do not meet this condition shall not be used.

1.3 The items discussed in this question are requirements given in the TS-R-1 and are therefore required regardless of local jurisdictions' additional criteria. The appropriate paragraphs of the regulations were cited in the question. Incorporating these in the application would probably also require SAR modifications. However, this item is resolved by making performance of the items requested in the RAI a condition of revalidation.

1.4 A part of the application references materials that appear to be part of the application/SAR. The question was to have those items provided, not to generate new material. If these things are not part of the SAR, why are they pointed to as being part of the SAR? Why are they not in the materials submitted? It is the purview of the package designer to establish the essential elements of the operations for package use, while site/user-specific procedures are developed from those essential elements.

This material may still be included in the application; yet it was not clear to the staff that such is the case. Thus, clarification is needed.

1.5 Staff does not think the question (regarding wipe tests) was understood. However, further review indicates this is something that staff does not need to pursue further.

Additionally, the applicant sent a number of drawings with their response.
However, Drawing No. 1860A-B1-010-00 had problems with viewing the second page of the drawing.

Also, there needs to be a technical drawing for the source drawers in, or referenced by, the approval certificate since this item appears to be relied upon to maintain the source position and provide axial shielding. If there is a different item used for the Co-60 pencils, that drawing would need to be provided as well. However, this may be dealt with by listing certain requirements upon the source drawer designs as conditions of revalidation.

Regarding the drawings in general, it is noted that technical drawings, which are to be a part of the certificate of approval, are included in the engineering report submitted with the application. It is not clear that this report is part of the SAR that is referenced in the certificate. Thus, to ensure the drawings are a part of the certificate, there should be a condition of revalidation that indicates the packagings shall be fabricated in accordance with the technical drawings contained in the engineering report. (Staff did not see anything that appears to be a technical drawing in the SAR or its appendices.)

It is not clear that the puncture tests for hypothetical accident conditions included tests through the package ends (where crumple shield does not
cover) at the end caps. The size of the opening is such that the puncture bar can access the end caps of the attenuator cask. This area can be vulnerable to damage and should be evaluated for/included in this test.

Further, there are other items staff is looking at to add as conditions for recommending revalidation. These include checks of surface contamination on the attenuator case as well as the crumple shield since the crumple shield is open and would allow access of debris to the attenuator case surface.
Another condition is a clarification that only Co-60 pencil sources may be loaded in package Configuration D and that the other three sources in this configuration are only point sources."

Please advise a suitable time for a phone call with the appropriate stakeholders.

Very Respectfully,

Chris Staab

NRC Project Manager

(301) 492-3321

Analogue & Digital Measurements P/L
ABN: 57 005 531 484

http://admeasure.com.au
sales@admeasure.com.au

27 Cumberland Drive
Seaford, 3198
Victoria Australia

Ph: 03 8770 6500
Fax: 03 8770 6590

MICHAEL.CONROY D.O.T. **10/02/09**
CHRISTOPHER.STAAB N.R.C.
JOHN MILLER International Isotopes.

Subject Answers to Questions arising from the 1860 Teleconference.

Dear Sir's
Four subjects require to be answered after the detailed discussion on the documentation and procedures relating to the Safety Analysis for the 1860A Transport Cask.

1. Source Drawer Design parameters.
2. Furnace characteristics for the Heat Test. TSR-1 728(a)
3. End Crumple Shield / Drop Test TSR-1 727 (b)
4. Cross referencing of Transport Documentation Table 60.

On approval of the variations to the Safety Analysis and associated drawings the Safety Analysis will be updated and presented to ARPANSA. We have been advised that this is in order as we have not changed the basic document, the variations are enhancements that add to the document not detract.

SOURCE DRAWER DESIGN PARAMETERS

The 1860A Type B(U) Transport Cask has been designed to accommodate a wide variety of source drawers, the drawer must be designed to ensure compliance to TSR-1 The 1860A drawers must follow one of two basic Drawer designs.

Round Drawer.	Diameter 62.7mm ± 0.15 X 548mm ± 0.15
Round Drawer Cavity	Diameter 65mm ± 0.15 X 550mm ± 0.25
Square Drawer	76.2mm X 76.2mm ± 0.15 X 560mm ± 0.15
Square Drawer Cavity	77.2mm X 77.2mm ± 0.15 X 564mm ± 0.25

Source drawers already suitable for use in the 1860 Cask are.

1. Item SD-R-1 A&DM 22x38mm capsule drawer Drg No 32041 Pg (316 stainless steel + Lead)
2. Item SD-R-2 Nordion / Theratronics / AECL round teletherapy source drawers. (brass/lead/stainless steel)
3. Item SD-S-3 Nordion / Theratronics / AECL square teletherapy source drawers. (brass/lead/stainless steel)
4. Item SD-R-4 Shepherd Mark 1 Laboratory Irradiator Drawer adapter. (stainless steel)
5. Item SD-R-5 CIS Alcyon Source Holder. (stainless steel)

6. Item SD-R-6 Picker / International teletherapy Capsule source holder (tungsten)

Drawer design, including dimensions and material selection with details of source must be approved by A&DM prior to the provision of the Transport Cask.

All Source Drawers must be designed to ensure the Capsule cannot move inside the source cavity, it is recommended that circular clearance be limited to capsule diameter + 1.0mm and longitudinal movement limited by an appropriate spring or non volatile packing material and retained by a positive mechanism e.g. circlip, threaded cap, etc.

Where multiple capsules are to be transported, the capsule nest must incorporate features that will prevent the capsules from moving against each other, this feature will be of special consideration for pencil sources.

To ensure dimensional conformity and predictable positioning of the capsule within the Cask all drawer configurations must comply to the above dimensions.
To increase the effective diameter of a Source Drawer, two styles of design should be considered.

a) Stainless steel split ring (63mm ±0.5mm OD and an ID 0.25mm ± 0.1mm smaller than the Source Drawer, by 10mm wide), designed to spring over each end of the Source Drawer.

b) Stainless steel or brass caps for each end of Source Drawer, 64mm OD with an ID equal to the OD of Drawer + 0.3mm

The longitudinal drawer dimension is to be 550mm ± 0.5mm. Where attenuation is required, spacers manufactured from tungsten and or lead filled stainless steel canisters are to be used. Where space is the only consideration, solid stainless steel is acceptable.

Where the drawer is a non symmetrical design the spacers must be adjusted to bring the capsule into the center of the drawer tube If the capsule cannot be made to sit central (longitudinally) in the Cask, configuration “D” must be considered.

When a design is approved it will be issued with a design item number for future use.

HEAT TEST OVEN TSR-1 728(a)

The Furnace used to carry out the Heat Test (TSR- 1 728(a) is a heat treatment furnace for annealing steel castings and is owned by;

L.S.W. Group
17/19 Promenade St
Yennola
New South Wales
Australia

The oven is 1383mm high X 965mm wide X 2700mm long, the system is fired by two gas burners each of 100,000 BTU per minute, the flame is generated horizontally and directed upward through the floor into the chamber from both sides to create a turbulent heat medium. Heat transfer is primarily by convection.

The original manufacturers specifications are no longer available, to maintain the requirement for the furnace to carry out the heat treatment function of maintaining a

uniform temperature over 900°C through out the furnace, it has been refurbished many times over the years.

The controller is set to give maximum heat input until the measured temperature is within 50°C of set point at which time the gas flow is controlled diminishing the heat input until stability at set point is reached.

The test engineer for ANSTO Mr Bill Townsend was contacted to discuss the heat test. Mr Townsend has reviewed his notes on the testing and we are assured that the requirements of TSR-1 were considered and the test protocol approved.

The thermocouple used for determining the temperature of the environment was attached to the Cask and therefore took into account both convection and radiant heat inputs. It was confirmed that the controller temperature was between 870 and 930°C for the duration of the test and the Cask outer temperature reached 800°C in 5 mins and was maintained above 820 °C for the duration of the test.

Email feed back from Mr Townsend relating to ANSTO's work on the Testing is attached.

End Crumple Shield

The centre tube of the End Crumple Shield is 6” N.B. Schedule 10 pipe which has an I. D. of 156.5mm. The test bar for the 1M drop test TSR-1 para 787 (b) is 150mm, This brings forward the possibility of the force of impact being directly onto the end cap without the protection of the crumple shield. In the unlikely event of this happening the worst case scenario is considered.

For the bar to be able to enter the tube it would have to be axial to the center line of the Cask, as the top of the bar is flat, the impact force would be taken by the security lock bolt protection cover and test port plug, then transferred out to the end cap.

If this should happen there is a high probability of the security lock bolt protection cover being damaged such that the end cap will be difficult to remove, to download the source drawer it would have to be removed from the opposite end, the Cask would be removed from service, as the cask would almost certainly require maintenance.

Because it is possible to reach the end of the Cask through the crumple shield tube it is argued that the transport index at the end should be measured from the end cap not the outside of the crumple shield. We argue that it is only possible to reach this area with hands and therefore does not pose an elevated risk to body exposure and therefore the transport index measured from the Crumple Shield is valid.

We have considered the proposition of making a simple bolt on cover over the access tube to the end cap and test port, which would address both issues.
The addition of a cover plate at the time of construction would be relatively simple and it would not interfere with the design of the Cask,
With the units already built, this creates issues relating to the dimensions of the Cask nominated on the Certificate that would require recertification by ARPANSA.
An option would be to fill in the access hole to the end cap by welding a flange inside the end ring with a hole large enough for access to the test port plug, this would make the use of the Cask more difficult but would resolve both objections without interfering with the design.

TABLE CROSS REFERENCING

To ensure a complete understanding of the various document lists, table 60 (page 198 of the Safety analysis) has been modified to cross reference the listings to the relevant table or text.

Item	*Description*	*Static Ref*
1.	Radiation Transport Cask Documentation Check List	Page 208
2.	Shipping Check List	Page 208
3.	Pre Transport Check List –Unloaded (UN2908)	Table 62
4.	Post Transport Check List – Unloaded (UN2908)	Table 63
5.	Pre Transport Check List –Loaded (UN2916)	Table 64
6.	Post Transport Check List – Loaded (UN2916)	Table 65
7.	Pre Transport Check List –Return Unloaded	Table 62
8.	End of Mission Inspection	Table 66
9.	Confirm Tool Box Content Inspection	Table 67
10.	Minor Repairs	Page 210
11.	Major Repairs	Page 211

MAXIMUM ACTIVITY

We accept the proposition of setting a lower level of allowable activity that can be transported in the Cask until actual measurements can be taken to prove the design. A configuration “C” will soon be loaded with a 10,000 Ci Co60 source, this loading will clarify the argument relating to the attenuation figures used in our calculations.

For the immediate future we are only building configurations “C” and “F”, the probability is that the next unit to be built will be for a Configuration “D”. As the other configurations are for smaller activity there is not a pressing need, as a larger capacity can always be used, therefore time is not an issue for the smaller configurations which will be built on a needs basis.

Drawing No1860A-D1-105-00 which could not be found in our transmission of the enhanced drawings is attached.

We trust the above answers enable approval of our Cask to proceed, should additional questions be raised we will answer them as judiciously as possible.

Yours Faithfully

E.T. Parrott

From: TOWNSEND, William [wmt@ansto.gov.au]
Sent: Monday, 2 February 2009 1:49 PM
To: ted@eqss.com.au
Subject: RE: A&DM1860 Cask - thermal analysis [SEC=IN-CONFIDENCE:COMMERCIAL]

Hi Ted,

Just on a trivial note I've look back over my calculations and found the error/s, i.e. they were just a couple of typos. As you said the net result was a 1°C change in temp at surface of package but still well below limit. I've made corrections (shown in red) in my spreadsheet to show difference, which I've attached for your curiosity. Important thing to note that this is a very conservative result since the heat dissipated through ends of package have not been considered.

I hope all goes well with the US application.

Regards,

Bill Townsend
ANSTO E&TS
Ph 61 2 9717 9848
Fax 61 2 9717 9269

-----Original Message-----
From: TOWNSEND, William
Sent: Friday, 30 January 2009 3:50 PM
To: Ted Parrott (ted@eqss.com.au)
Cc: BREEN, Gerard
Subject: A&DM1860 Cask - thermal analysis [SEC=IN-CONFIDENCE:COMMERCIAL]

Hi Ted,

After talking to you yesterday, I discovered the phone number I gave you for the LSW Group Pty Ltd (Yennora site) was the fax number; their phone number is (02) 9681 4811. If you can obtain any specs on the furnace, can you please forward onto me; if we have the materials of construction we can look up table for emissivity values; for example in refractories furnace liners Kaolin insulating bricks have an emissivity of 0.7 at 800°C.

I've had bit of a closer look into some of the finer details of the thermal test (clause **728**) of the ARPANSA Code of Practice, RPS2 (2008 edit). Since this code is an adoption of the IAEA Regulations, then the advisory material published by the IAEA is also very useful, i.e. please refer to their website for a copy of the guidelines: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1325_web.pdf. Clause **728.22** of the guidelines points out some tips for using a furnace which lends support to our test method, i.e. the internal surface of the furnace was very much larger than the envelop area of the package, a higher furnace temperature was used, and the package was in the furnace for an extended period.

At the moment I'm thinking our saving grace is the fact that we located a thermal couple in contact with the outer surface of the package which gave us a direct indicator of the temperature of the surface of the package. Irrespective of the mode of heat transfer to the package (i.e. radiation, convection, conduction) we had established a goal of maintaining the surface of the package at a temperature above what was required.

Please let us know how you get on with acquiring the relevant information or if we can be of further assistance to you, cheers.

Regards,

Bill Townsend

Mechanical Engineer

Nuclear Mechanical Services Unit,

Technical Services & Facilities Management

Australian Nuclear Science and Technology Organisation

PMB 1, Menai, NSW 2234, Australia

tel: +61 2 9717 9848

fax: +61 2 9717 9269

web: www.ansto.gov.au

A&DM1860 Type B(U) transport package

References:

1. ARPANSA Code of Practice, Safe Transport of Radioactive Material, 2001 Edition

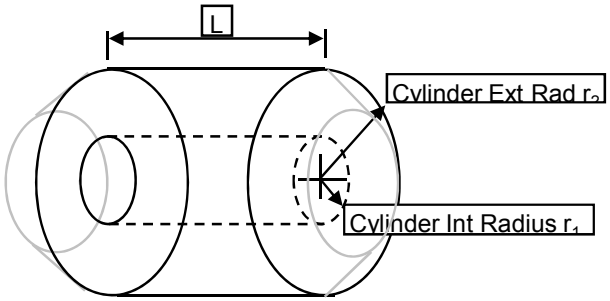
2. Frank P. Incropera, David P. DeWitt, Fundamentals of Heat & Mass Transfer, 4th edition, John Wiley & Sons Inc, USA, 1996.

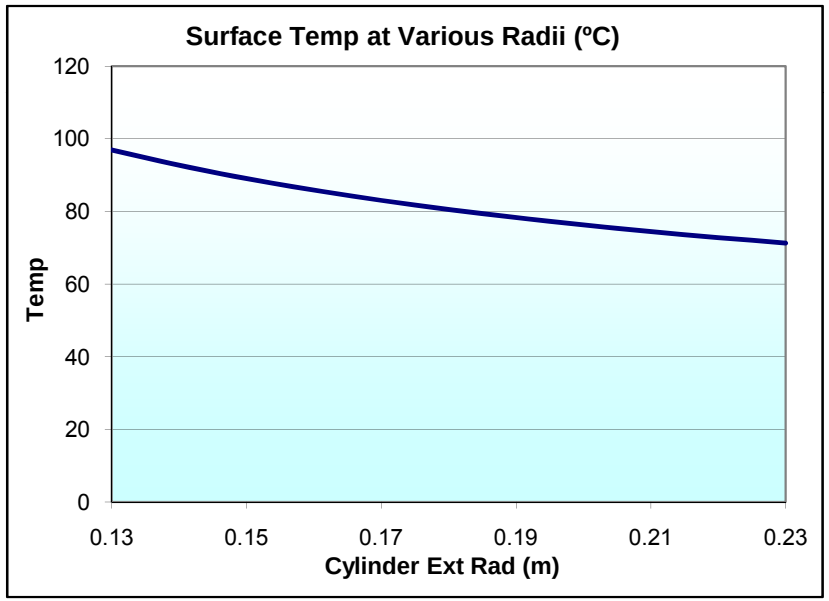
- ARPANSA clause 617 analysis: surface of package shall not exceed 50ºC at an ambient of 38ºC

Heat Input (W):	250	
Convection coefficient air - free convection (W/m^2K)	20	
Ambient Temperature (ºC)	38	311 K
Length of cylinder (mm)	260	0.26 m

[Cylinder length - Main body 260mm; Full length 600mm]

Cylinder External Radius (m)	Surface Temp (ºC)
0.13	**96.86**
0.14	92.65
0.15	89.01
0.16	85.82
0.17	83.01
0.18	**80.51**
0.19	78.27
0.20	76.26
0.21	74.44
0.22	72.78
0.23	**71.27**





A&DM1860 Type B(U) transport package

- ARPANSA clause 617 analysis: surface of package shall not exceed 50ºC at an ambient of 38ºC

Fin Analysis

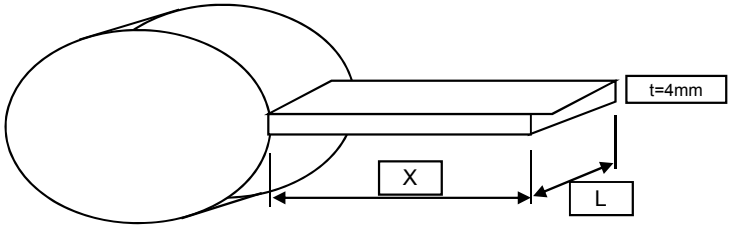
Ambient Temperature of air (ºC)	38	**311** K
Base Temperature of one fin (ºC)	71.3	**344** K
Convection coefficient air - free convection (W/m^{2}K)		**20**
Convection coefficient assumed to be 20 W/m.K		
Conduction coefficient for Stainless Steel 316 calculated to be:		**14** W/m.K

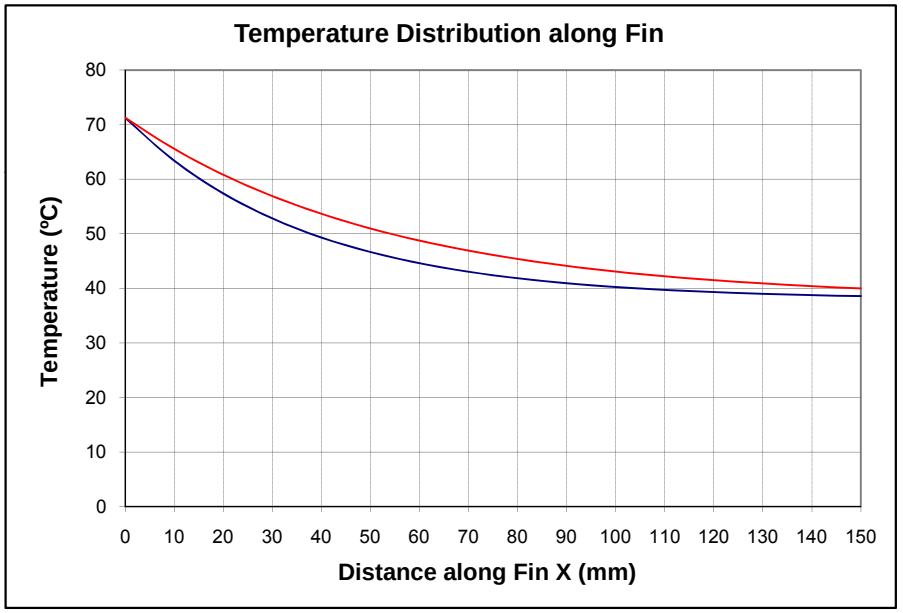
$m = (hP/kA_c)^{0.5}$

$m = \sout{26.930925}$ m= 18.8254

(initial m value was calculated with P=0.528 when it should have been 0.258)

Distance along Fin X (mm)	Temperature Distribution (ºC)	Temp Dist Corrected (ºC)
0	71	71
10	63	66
20	57	61
30	53	57
40	49	54
50	47	51
60	45	49
70	43	47
80	42	45
90	41	44
100	40	43
110	40	42
120	39	41
130	39	41
140	39	40
150	39	40

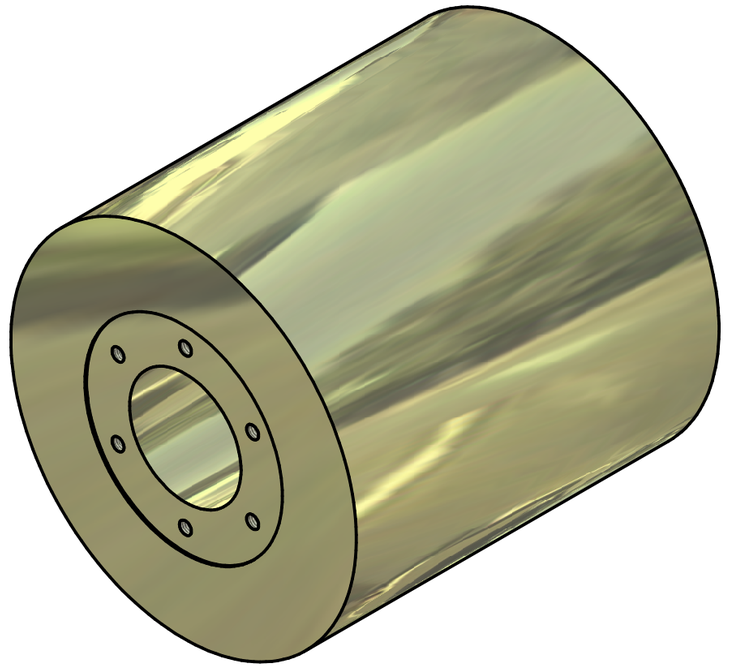




Long Fin assumption verification, i.e. to be valid m x L ≥ 2.65

m x L = **4.89** therefore assumption is valid!

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
1	120Øx1mm recess changed to 114.4Øx1mm to suit Draw Tube Flange modification.	12/04/2006	RT
2	Raised Drawing to A&DM Standarads	24/05/2006	LJG



ISO View
SCALE 0.40 : 1

APPROVED
By Lachlan Grogan at 11:40 am, Aug 25, 2006

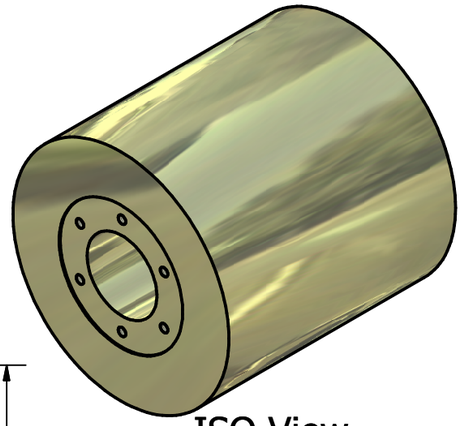
DRAWN	RT	16/02/2006
CHECKED	ETP	11/04/2006
QA		
MFG		
APPROVED		

Analogue & Digital Measurements P/L
http://admeasure.com.au

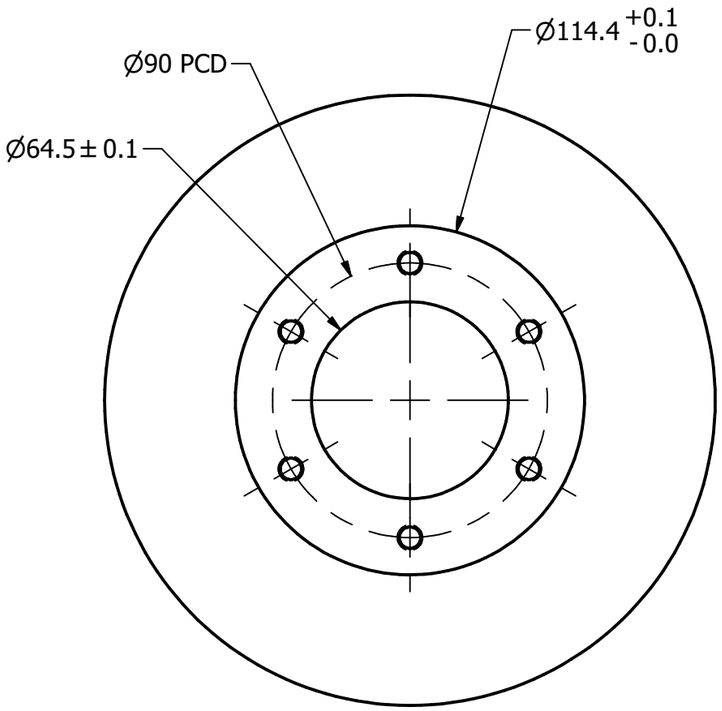
Model Number: 1860A
Component Name: 1860A-D1-105
Component Desc: Attenuator Primary
Drawing Desc: Part Details

SIZE	SCALE	DWG NO		REV
A3	N.T.S	1860A-D1-105-00	SHEET 1 OF 2	2

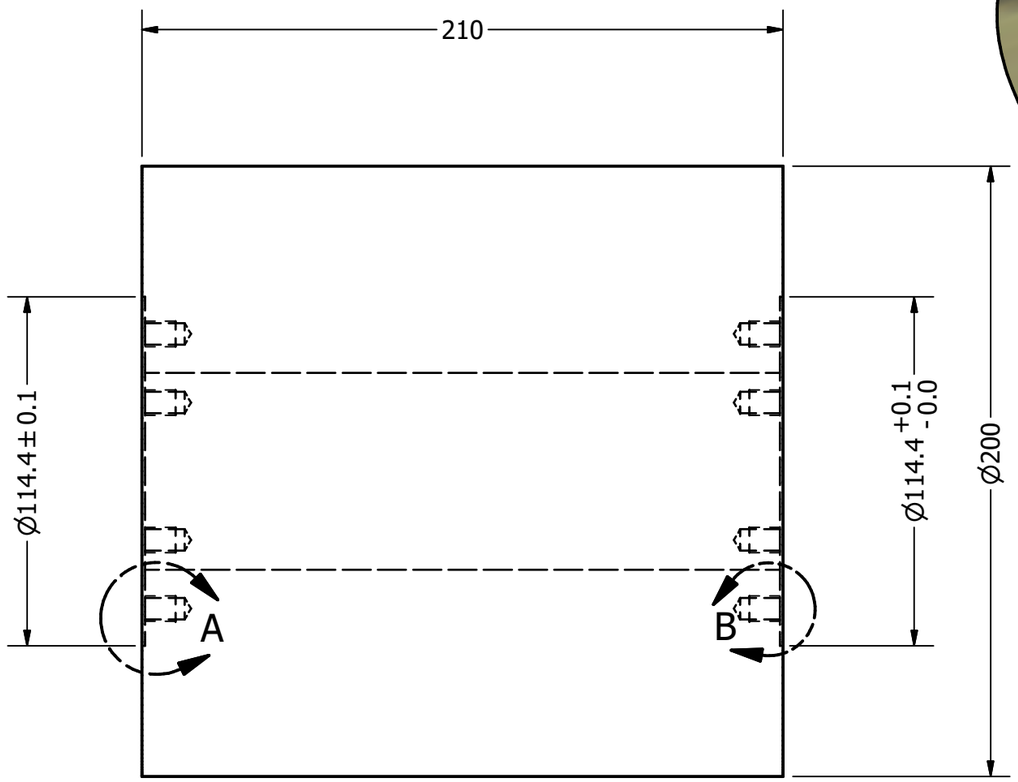
Parts List				
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
1	1	1860A-D1-105	Attenuator Primary	97% Tungsten W/NiFe



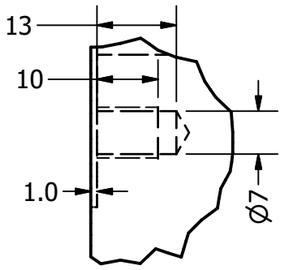
ISO View
SCALE 1 / 4



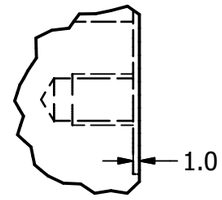
VIEW2
SCALE 1 / 2



VIEW3
SCALE 1 / 2



DETAIL A
SCALE 1 : 1



DETAIL B
SCALE 1 : 1

DRAWN RT	16/02/2006	
CHECKED ETP	11/04/2006	
QA		
MFG		
APPROVED		

Analogue & Digital Measurements P/L
http://admeasure.com.au

Model Number: 1860A
Component Name: 1860A-D1-105
Component Desc: Attenuator Primary
Drawing Desc: Part Details

SIZE	SCALE	DWG NO	SHEET 2 OF 2	REV
A3	N.T.S	1860A-D1-105-00		2

APPROVED
By Lachlan Grogan at 11:40 am, Aug 25, 2006