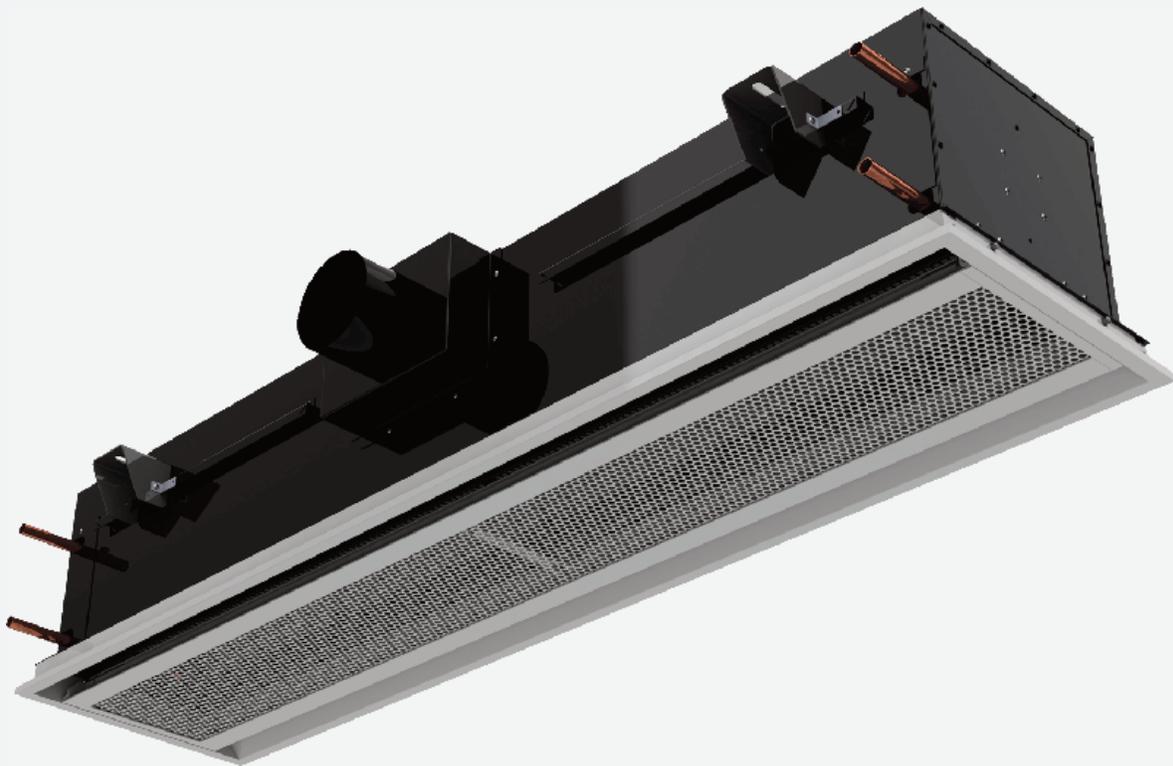


Installation, Operation and  
Maintenance Manual

Active Chilled Beams  
Type DID301 and DID302



# Contents

## General Information

1.1	Introduction	3
1.2	Safety	3
1.3	Symbols used in this manual	3
1.4	Receiving, Inspection and Storage	3
1.4	Damage reporting	3

## Product Description and Installation Preparation

2.1	Product overview	4
2.2	Construction description	4
2.3	Application precautions	4
2.4	Preparation for installation	4
2.4	Items provided by installer	4
2.4	Precautions	4

## Installation

3.1	General procedure	5
3.2	Installation considerations	5
3.3	Hanging the chilled beam	5
3.4	Air connections	6
3.5	Water connections	6
3.6	Flushing the water piping system	7
3.7	Filling and venting the water system	7
3.8	Typical installations	7

## Commissioning

4.1	Waterside commissioning	8
4.2	Airside commissioning	8
4.3	Airside commissioning tables	8-9

## Maintenance

5.1	Cleaning instructions	9
5.2	Replacement parts	9

## Troubleshooting

6.1	Symptoms & Solutions	10
-----	----------------------	----

## Warranties

7.1	Representations and Warranties	11
-----	--------------------------------	----



TROX USA, Inc.

4305 Settingdown Circle  
Cumming, Georgia 30028

Phone: 770.569.1433  
Fax: 770.569.1435

E-Mail: [trox@troxusa.com](mailto:trox@troxusa.com)  
[www.troxusa.com](http://www.troxusa.com)

# 1 - General Information

## 1.1 Introduction

This installation, operation and maintenance manual is intended for active chilled beam Type DID301 and DID302.

**You must read all instructions prior to the installation, operation or maintenance of this product. Take special note of the information that is accompanied by the symbols described in section 1.3 below.**

The DID301 and DID302 active chilled beams are designed for dealing with high internal thermal loads using a combination of air and water. This is achieved by using primary air delivered via ductwork and chilled water delivered via pipe work from the central plant, directly to the beam. Primary air is ducted to the upper air chamber via a side or top inlet. The primary air is then discharged through nozzles to a lower section containing a 2- or 4-pipe heat exchanger coil. This causes room air to be induced via the unit's face panel, up and through the heat exchanger coil. The cooled (or heated) room air is then mixed with the primary air before being delivered back to the space through the beam's discharge slot(s).

The beam uses the primary air energy to induce air through the coil; it does not contain any moving parts, fans or motors.

## 1.2 Safety

The customer must use qualified personnel and follow all applicable building codes and safety regulations when installing, commissioning and performing maintenance of this product. Eye protection, gloves and hard hat should be worn at all times when handling the product.

Consult all local building, occupational safety and other codes applicable to the installation.

Please pay particular attention to the symbols used throughout the manual that indicate safety related issues, warnings and important notices or information; read the complete manual before installation and be familiar with the meaning of the safety symbols in the next section 1.3.

## 1.3 Symbols used in this manual

When reading this manual, particular attention must be given to the parts marked with the following symbols:

	<b>Warning!</b> Indicates a potentially dangerous situation for the product and the environment
	<b>Important!</b> Designation of a danger that can cause personal injury or damage to property.
	<b>Note</b> Indicates important notices or information

## 1.4 Receiving, Inspection and Storage



### Fragile

Handle with care. The chilled beam should not be handled using the water pipes or damage to the coil assembly may result!

All TROX products are inspected and tested prior to shipment to ensure the highest quality. Chilled beams are packed individually in cardboard cartons.

Upon receipt of the chilled beam shipment, conduct a thorough inspection of the outer packaging and pallets for possible damage. If damage has occurred during shipping, indicate the damaged items on the delivery papers immediately and inspect the chilled beams contained in those containers for damage.

If damage has occurred during shipping, immediately file a claim with the carrier.

Refer to the **Manufacturer's Representations and Warranties** (included in each carton and on page 11 of this manual) for detailed handling instructions and damage reporting procedures.



### Note

Chilled beam should not be removed from its individual carton for storage. Beams should not be unpacked until they have been moved to the installation location and just before installation is to begin (see details on pages 4-5).

Beams should be stored in a clean and dry location. If beams remain packaged as delivered (strapped and wrapped on pallet), they can be stored as delivered (do not stack pallets). If packaged beams are removed from pallet, they should not be stacked more than four high. Packaging is not suitable for outside storage.

# 2 - Product Description/Installation Preparation

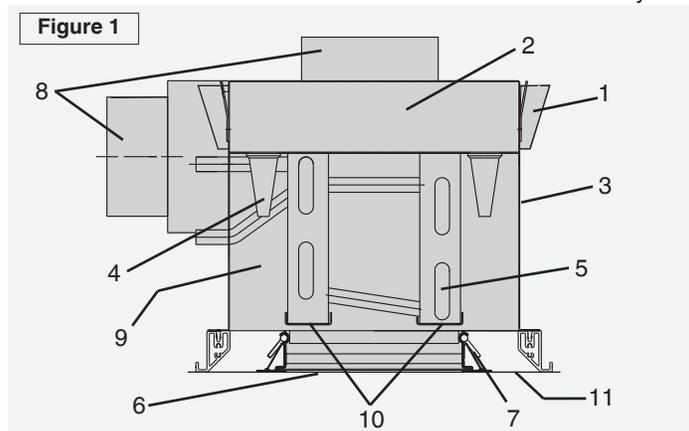
## 2.1 Product overview

Chilled beams are ceiling mounted heat exchangers. Primary air is introduced into the active chilled beam through induction nozzles. This series of nozzles induces room air into the chilled beam and across its water coil where the room air is either cooled or heated. The now cooled or heated room air is mixed with the primary air and discharged back into the space to control the room temperature. TROX DID301 and DID302 active chilled beams should be installed in the quantities, sizes and configurations shown on the project plans and schedules.

## 2.2 Construction description

The assembly (figure 1) of the DID301 and DID302 consists of:

- |                              |  |
|------------------------------|--|
| (1) sliding hanging brackets | (7) face retention bolts   |
| (2) primary air chamber      | (8) side or top primary air inlet  |
| (3) casing                   | (9) mixing chamber   |
| (4) discharge nozzles        | (10) condensate drip tray  |
| (5) coils                    | (11) one (DID301) or two (DID302) discharge slots on front face assembly |
| (6) removeable inner border  |  |



## 2.3 Application precautions

**Note**  
 DID301 and DID302 active chilled beams provide sensible cooling only and cannot be used to do latent cooling.

Condensate drip trays (optional) are located beneath the heat exchangers to collect any condensate resulting from under-shooting the dew point temperature in the cooling mode. Long-term operation below the dew point (wet operation) must be avoided.

The primary air delivered to the space must be of sufficient quantity, temperature and dryness to ensure the room dew point temperature is maintained above the temperature of the chilled water supplied to the beam. The recommended chilled water supply temperature should be at least 1°F above the room dew point temperature.

## 2.4 Preparation for installation

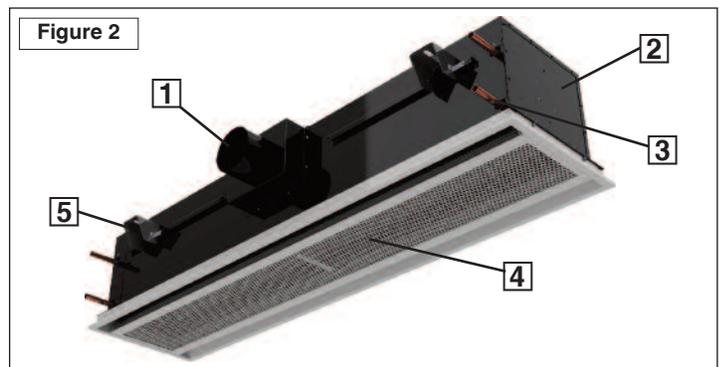


### Important!

Installation is to be performed by properly trained and authorized personnel only! Read all instructions before beginning installation.

### 1.) Chilled beam unit (figure 2) delivered by TROX USA with:

- 1) Round primary air connection
- 2) Primary air chamber
- 3) Water connections
- 4) Induction grille
- 5) 4 to 6 sliding hanging brackets



### 2.) Installer to provide (according to all applicable building codes):

- A suspension system (including all hardware) for mounting the chilled beam
- Flexible duct (recommended) or sheet metal duct for air connection
- Primary air volume control damper (can be provided by TROX)
- Flexible hoses (recommended) for water connections from assembly to the supply and return water circuits (unless factory furnished flexible hoses are included with product order) or hard connections.

### 3.) Precautions:



### Important!

Wear eye protection and gloves during installation. Product includes sharp edges and burrs.



### Product is heavy!

Machinery recommended for movement and installation of beams. Refer to table below for unit weights and use caution when removing from packaging.

Chilled beam should be placed on the ground with perforated induction grille (see figure 2) facing up!

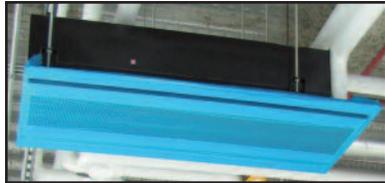
Chilled Beam Length	Chilled Beam Weight	Chilled Beam weight w/ fully charged coil
2' Unit	24 lbs	25 lbs
4' Unit	48 lbs	51 lbs
6' Unit	72 lbs	76 lbs
8' Unit	96 lbs	101 lbs
10' Unit	120 lbs	127 lbs

# 3 - Installation

## 3.1 General procedure

Chilled beams should be mounted and connected prior to installing the suspended ceiling or drywall. The unit should be installed in the location shown on the design drawings. Deviation from the designed mounting position should be avoided as the chilled beam location in relation to the room walls and other chilled beams is critical to the comfort of the conditioned space.

The chilled beam leaves the factory with low tack film applied to the face (see photo) to protect the painted surface. Film should remain on beam during installation. **Remove the film before the air system is started.**



## 3.2 Installation considerations



### Note

It is recommended that chilled beams be installed using flexible hoses.

***If hard connections are used, the connections should be made after the chilled beam is lowered into the ceiling grid and is in its final position.***

## 3.3 Hanging the chilled beam (by Mechanical Contractor)

### STEP ONE —

- Determine beam locations according to design drawings.
- Fix anchors (type dependant on building design and determined by others) into the structure above the chilled beam mounting location.

### STEP TWO —

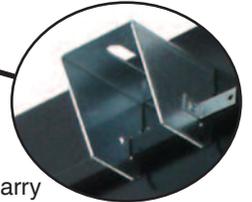
The beam should be suspended 3" above the finished ceiling elevation using building code approved threaded rods (recommended) or wires. The rod or wire (both provided by others) allow the beam's vertical height to be adjusted so that the beam can be lowered into the ceiling grid with which it is to be integrated.

It is recommended that the unit be suspended from **linear channels** to provide adjustability in every direction.

The unit is provided with **sliding hanging brackets** that allow for adjustment along the length and width of the beam (both shown here):



**Linear Channels**



**Sliding brackets**

### Guidelines when using rods

- 1 Install Unistrut with appropriate support to carry the beam
- 2 Fasten studs to Unistrut with Unistrut nut in proper location above the beam's hanging brackets
- 3 Adjust beam as needed to final hanging location

### Guidelines when using Wire

- 1 Distribute sliding brackets evenly spaced along the sliding rail on the plenum box of the beam
- 2 Wire should be looped through and around the *inside* of the bracket
- 3 Wires should run from the bracket straight up or slightly away from the beam to the anchor location.



### Warning!

The hanging wire should NEVER angle across the beam as it will put undue stress on the sliding bracket and rail.

### Suspension device requirements

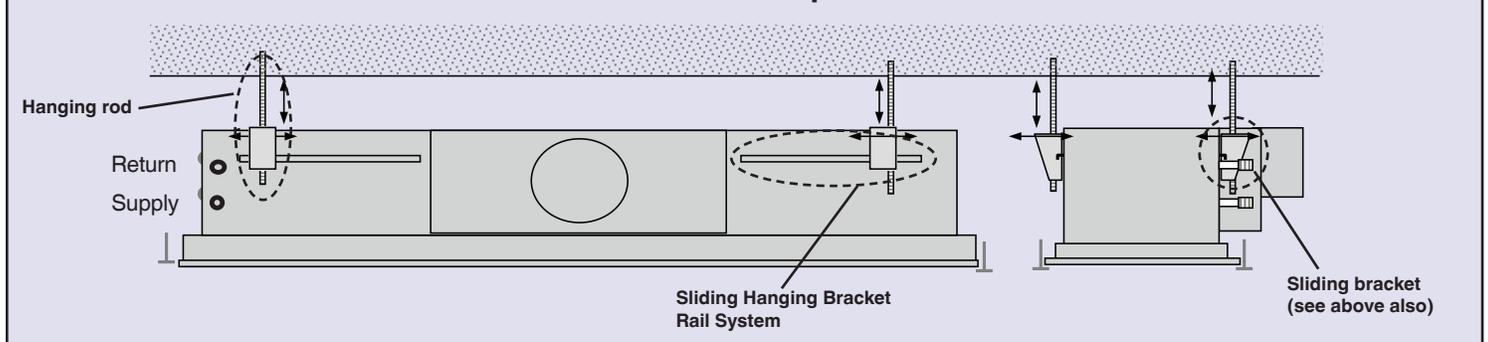
Chilled beams up to 6 ft in length should be supported by a minimum of four (4) suspension devices. Chilled beams above 6 ft in length must be supported by a minimum of six (6) suspension devices.



### Warning!

Each unit must be supported independently from the suspended ceiling. The fixing points should only carry the weight of the chilled beam. Separate supports should be provided for adjacent systems components.

## Installation Example



# 3 - Installation

Once the chilled beam is lowered into the ceiling grid and is in its final position, the air and water connections can be made.

## 3.4 Air connections

### STEP ONE —

Make the air connection with either sheet metal or flexible duct.



#### Note

Flexible duct, when used in conjunction with flexible hose for water connections (see detail below), enables easier alignment of the beam with the ceiling grid!

Flexible duct should be limited to a maximum length of 5ft. The air connections should include a minimum of one duct diameter length of straight ductwork upstream of the beam connection to prevent excessive turbulence and noise generation.

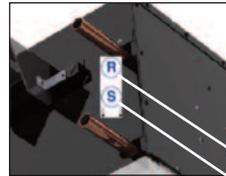


#### Note

Active chilled beam systems operate at higher terminal pressures than diffusers in standard VAV systems therefore the ductwork and connections feeding the beam must be thoroughly sealed to prevent excessive leakage.

## 3.5 Water connections

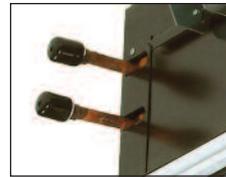
The chilled beam is fitted with two or four water pipes which terminate in either NPT threaded male connections or straight pipe ends for field soldering. Each coil is factory tested for leakage and provided clean and capped.



### STEP ONE —

Identify the warm and/or chilled water **supply** \*connections on the beam — noted by labels on the casing. Blue indicates chilled water, red indicates warm.

— Chilled Water - Return  
— Chilled Water - Supply



### STEP TWO —

Remove the plastic cap before making the final water connections.

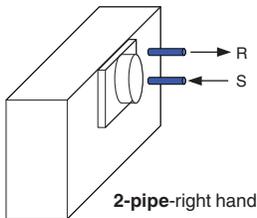
### STEP THREE —

Make water connections. If NPT connections apply, do NOT over-tighten — applying excessive force on the water pipes may damage the heat exchange coil.

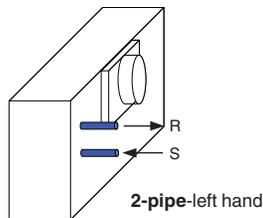
**NOTE:** See section 3.8 (page 7) for typical installation photographs.

## Active Chilled Beam Pipe Configurations

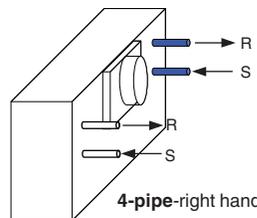
— Chilled water  
— Warm water



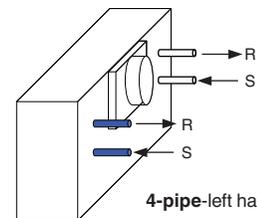
2-pipe-right hand



2-pipe-left hand



4-pipe-right hand



4-pipe-left hand

**DID302 2-pipe connection**  
(can be cold or hot)

**DID302 4-pipe connection**  
(Standard Construction)

**Note: Air duct connection location does not affect coil connection configuration**  
(See submittal for additional information on pipe handings)

## 3 - Installation

### 3.6 Flushing the water piping system

Before flushing the water system, close all valves that isolate the beams and flush the main piping system first.

### 3.7 Filling and venting the water system

To ensure easy venting, the main pipes should be installed at a higher level than the beams. The horizontal pipes should be installed rising slightly towards the venting points.

Before filling, all shut-off and control valves must be in the fully open position. The pumps should not be running during the filling-up (static filling). Continuous venting is necessary. The installation of both manual and automatic venting systems is recommended. The pump should only be started when filling is complete.

To remove all air from the system, the majority (>75%) of the system should be closed so that the water can circulate fast enough. When each section is full, it should be closed and the procedure repeated throughout the system.



#### Note

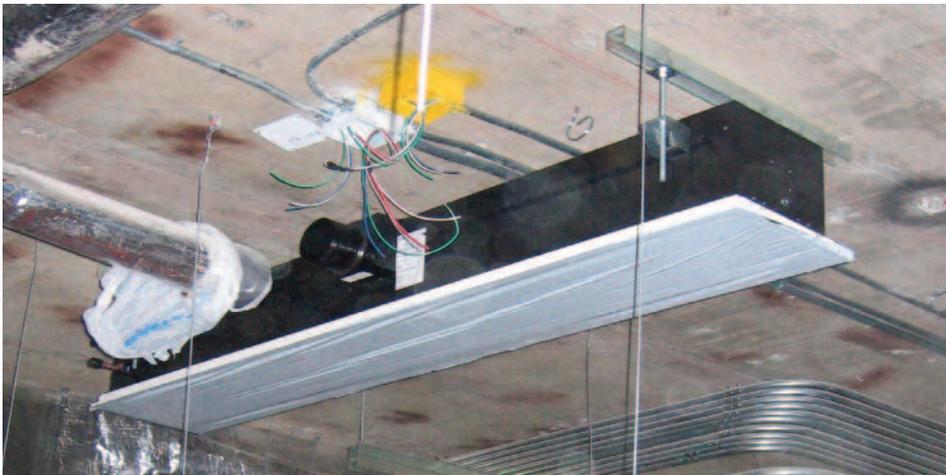
There should be no high points to create "air pockets" within the system.



#### Note

Use non-chilled water when filling up the system! Cold water can cause immediate condensation on the pipes. Warm water contains less oxygen which can limit venting to some extent.

### 3.8 Typical active chilled beam installation photos



**Active chilled beams with 2-way flow shown during installation**



**Active chilled beams - finished installation**

# 4 - Commissioning

**Important!**  
Commissioning is to be performed by properly trained and authorized personnel only!

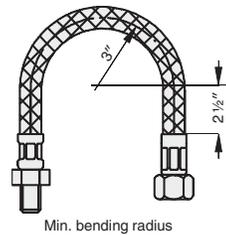
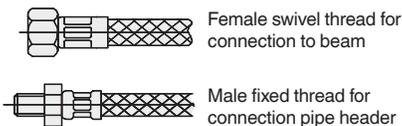
**Important!**  
Wear eye protection and gloves.  
Product includes sharp edges and burrs.

## 4.1 Waterside commissioning

- 1 Fully purge the complete hydronic system of air prior to commissioning.
- 2 Carefully inspect the system for leaks, paying particular attention to the connections.
- 3 Carefully inspect flexible hose, if applicable, for leaks. *Factory-provided* flexible hose shown (not provided on all orders).

### Flexible hose

For water connection 1/2" NPT



**Note**  
The chilled beam is not provided with any water flow control or measuring devices, therefore the pipe work system should be fitted with sufficient balancing aids to enable adjustment of the flow rate.

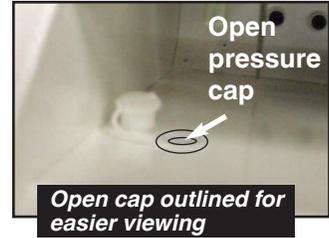
## 4.2 Airside commissioning

**Note**  
Do not attempt to read the total discharge airflow rate using a hood or any other device that adds downstream pressure to the beam, as it will reduce the amount of induction and give false readings. The total air flow (primary + induced) cannot be measured.

The primary air flow rate is determined by measuring the static pressure in the primary air chamber and referring to the calibration chart label provided on each beam or by calculating the volume by using the formula and tables in section 4.3.

### To measure static pressure:

- 1 Locate the pressure tap fitted in the nozzle plate at the pipe connection end of the beam (see image). To reach the tap, it is not necessary to lower induction grille, but it can be lowered if preferred. Remove cap.



- 2 Attach a measuring gauge (as shown here):



**Note**  
The constraints detailed in the following tables are for standard TROX chilled beams. For chilled beams with non-standard nozzle configurations, contact Trox USA.

## 4.3 Airside commissioning tables

The primary air volume in CFM can be calculated with this formula:

$$CFM = C \times \sqrt{\Delta P}$$

- CFM** = primary airflow (CFM)  
**C** = constant - read from tables below  
**ΔP** = static pressure measured in primary air chamber (in. W.G.)

**Table 1:**  
Commissioning constraints for DID302

Beam Length	K		
	A	B	C
4'	59	97	150
5'	69	114	175
6'	79	130	200
7'	93	154	238
8'	108	179	275
9'	123	203	313
10'	138	227	351

# 4/5 - Commissioning/Maintenance

## 4.3 Airside commissioning tables, continued..

**Table 2:**  
Commissioning constraints for DID301

Beam Length	K		
	Nozzle Type		
	A	B	C
4'	30	49	75
5'	34	57	88
6'	39	65	100
7'	47	77	119
8'	54	89	138
9'	62	102	157
10'	69	114	175

**Example:**

DID302; 6ft; B-nozzle, measured static pressure of 0.33 in. W.G.

$$C = 113 \text{ (from table 1)}$$

$$CFM = 113 \times \sqrt{0.33}$$

$$= 65 \text{ CFM}$$

### 5.1 Cleaning instructions

The chilled beam unit contains no moving or consumable parts, therefore the maintenance requirements are limited to periodic inspection for leakage and occasional cleaning of the heat exchanger coil, induction grille and, where applicable, the condensate trays.

The accumulation of dust on the heat exchanger coil will eventually restrict the airflow through the coil, reducing cooling and heating performance.

The inspection frequency is subject to the environmental conditions and occupancy levels, for example, environments where bed linen is in use will require more frequent cleaning than office environments.

It is recommended that the beams be inspected on an annual basis until a pattern is established.



**Important!**

Maintenance is to be performed by properly trained and authorized personnel only!



**Important!**

Wear eye protection and gloves.  
Product includes sharp edges and burrs.

### 5.1 Cleaning instructions

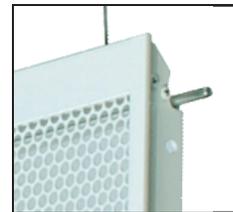


**Warning!**

Return grille, though fitted with two safety wires, will still hang down from the face of the beam approximately 6 inches if allowed to drop freely. Use care and lower beam slowly until wires are taut.

### To clean the heat exchanger coil:

- To access the coil, remove the grille face by unlocking the four (4) sliding pins which are located in the channels behind the grille face. The grille is attached to the chilled beam case by two safety wires to prevent the face from falling completely. Lower the grille gently until it is hanging vertical to the ceiling.



Four sliding pins (as shown here) hold grille face in place.



**Important!**

For beams longer than 4' in length, it is recommended that 2 people lower the induction grille for cleaning and maintenance.

- Using a soft nozzle brush attachment, gently vacuum in the direction of the beam's coils to remove any accumulated dust.



The unit's two (2) vertical coils should be vacuumed from the opening between the coils in the center of the beam (shown here)

- After cleaning the coils, carefully raise the induction grille back into place and slide the pins securely into the beam's casing and in the locked position.

### To clean the beam face:

If necessary, the face of the beam and visible painted surfaces can be cleaned using a *mild detergent diluted with warm water*. Apply with a soft cloth, rinse and wipe dry.



**Note**

Strong or abrasive chemical detergents should not be used as they may cause damage to the paint finish. Only stubborn stains, if not removed by washing, can be wiped off with white spirit, but care is necessary to avoid affecting the gloss level of the surface by harsh rubbing.

### To clean condensate trays (where applicable):

If necessary, the condensate drip trays can be cleaned using a small amount of disinfectant applied with a soft cloth. Wipe dry.

### 5.2 Replacement parts

DID301 and DID302 chilled beams contain no serviceable or consumable parts.

## 6 - Troubleshooting

### 6 Troubleshooting

Symptom	Probable Cause	Solution
<b>Loss of airflow</b>	Obstruction on induction grille or heat exchanger coil	Remove induction grille and inspect/clean grille and heat exchanger as necessary
	Air connection detached from beam	Inspect attachment hardware and reconnect ductwork
	Obstruction in primary air plenum	Remove primary air connection and check for debris
	Air dampers incorrectly set	Inspect and adjust air damper as necessary.
	Faulty or incorrectly set air handling unit	Inspect and re-commission air handling unit (by certified contractor)
<b>Reduced Cooling</b>	Obstruction on induction grille or heat exchanger coil	Remove induction grille and inspect/clean grille and heat exchanger as necessary
	Loss of water circulation through heat exchanger coil	Inspect control valves and check flow using system test points
<b>Condensation on pipe-work or heat exchanger</b>	Chilled water temperature too low	Measure chilled water temperature and reset to design value
	Incorrect primary air temperature or condition	Measure room humidity level. If humidity is higher than design condition, the primary air is failing to control room humidity. The air handling unit must be set so the primary air is dry enough to offset the latent gains.
	Primary air volume too low	Measure primary air volume using procedure described in section 4.3. Increase air volume design figure.

# 7 - Representations and Warranties

## 7.1 Manufacturer's Representations & Warranties

<p style="text-align: center;"><b>TROX<sup>®</sup> TECHNIK</b></p> <p style="text-align: center;">MANUFACTURER'S REPRESENTATIONS AND WARRANTIES</p> <p style="text-align: right;"><b>TROX USA, INC.</b> 4305 Settingdown Circle Cumming, GA 30028</p> <p style="text-align: right;">Phone: +1 (770) 569 1433 Fax: +1(770) 569 1435</p> <p>These Representations and Warranties are applicable to all customers (the "Customers" and each, individually, a "Customer") purchasing products (the "Products") manufactured by TROX USA, Inc. (the "Company").</p> <p><b>1. Warranty and Limitations:</b></p> <p>1.1. Company warrants solely to the original purchaser of the Products that for the Warranty Period (as defined below), the Products will be free from defects in materials and workmanship under normal use, and will conform to Company's published specifications of the Products. Notwithstanding the foregoing, Company retains its right to deviate from its published specifications due to the latest innovations and improvements in function and design of the Products. The foregoing warranty is subject to the proper storage, transportation, installation, use and maintenance of the Products and does not include defects due to normal wear and tear or deterioration, improper modifications of the Products, improper construction of the surrounding facilities and unsuitable static, chemical, electrochemical or electrical conditions.</p> <p>1.2. In the event of any shipping and freight damages of the Product, Customer shall refer any claims to the shipping company.</p> <p>1.3. Upon delivery, Customer shall immediately and within seven (7) working days inspect the Products for conformity and visible defects (other than the shipping and freight damages described above in Section 1.2). Customer shall give Company immediate written notice of any non-conformities or visible defects regarding the Products, including photographs of the same, and contact Company in writing concerning return or repair, as the case may be. In order to make a determination regarding the existence of the alleged defect or non-conformity and the proper remedy thereof, the Company shall have the right to inspect the Products at Customer's premises. In the event that the Customer refuses to give Company access to its premises in order to inspect the Products, Customer shall lose all warranty claims related to the Products to be inspected.</p> <p>1.4. Any defect or non-conforming Product discovered upon delivery should immediately be stored in a safe place and not be installed. If the defective or non-conforming Product is installed, TROX USA shall not be liable for any labor or charges associated with installation or labor costs, unless specific prior authorization is issued in writing by an officer of the Company.</p> <p>1.5. Customer shall notify Company in writing of any defects of the Products immediately upon discovery. Any defect or non-compliant Product or part thereof should be put aside for inspection by the Company and should not be installed. Company's sole obligation under the foregoing warranty is, at Company's option, to repair or correct any such covered defect or to replace or exchange the Product. Customer shall bear all shipping and handling expenses related to the return of the Products. Any repaired, corrected, replaced or exchanged Products shall be subject to the warranty set forth in 1.1., following their repair, correction, replacement or exchange. If Company has received notification from Customer, and no defects of the Product could be discovered, Customer shall bear the costs that Company incurred as a result of the notice.</p> <p>1.6. With respect to orders made to custom, any defects of the Products caused by Customer's specifications are excluded from the warranty set forth in 1.1.</p> <p>1.7. Company also makes no warranty that the Products manufactured under an order made to custom do not infringe the intellectual property or other proprietary rights of any third party and Customer is solely responsible for assuring that such Products do not so infringe.</p> <p>1.8. The "Warranty Period" begins on the invoice date, and continues to be in effect for twelve (12) months.</p>	<p>1.9. Company does not authorize any person or party to assume or create for it any other obligation or liability in connection with the Products except as set forth herein.</p> <p>1.10. All requests and notices under this Warranty shall be directed to:</p> <p style="text-align: right;">TROX USA, Inc. 4305 Settingdown Circle Cumming, GA 30028 Fax: +1(770) 569 1435</p> <p>1.11. THE WARRANTY SET FORTH IN SECTION 1.1 IS MADE IN LIEU OF ALL OTHER WARRANTIES (WHETHER EXPRESS OR IMPLIED), RIGHTS OR CONDITIONS, AND CUSTOMER ACKNOWLEDGES THAT EXCEPT FOR SUCH LIMITED WARRANTY, THE PRODUCTS ARE PROVIDED "AS IS." COMPANY SPECIFICALLY DISCLAIMS, WITHOUT LIMITATION, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, OF ANY KIND, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, AND THOSE WARRANTIES ARISING FROM A COURSE OF PERFORMANCE, A COURSE OF DEALING OR TRADE USAGE.</p> <p><b>2. Limitation of Liability:</b></p> <p>2.1. IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFITS, REVENUE, GOODWILL OR USE, INCURRED BY CUSTOMER OR ANY THIRD PARTY, WHETHER IN AN ACTION IN CONTRACT, TORT, STRICT LIABILITY, OR IMPOSED BY STATUTE, OR OTHERWISE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. COMPANY'S LIABILITY FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE PRODUCTS. IT IS AGREED AND ACKNOWLEDGED THAT THE PROVISIONS OF THIS AGREEMENT ALLOCATE THE RISKS BETWEEN COMPANY AND CUSTOMER, THAT COMPANY'S PRICING REFLECTS THIS ALLOCATION OF RISK, AND BUT FOR THIS ALLOCATION AND LIMITATION OF LIABILITY, COMPANY WOULD NOT HAVE ENTERED INTO THIS AGREEMENT.</p> <p>2.2. IN JURISDICTIONS THAT LIMIT THE SCOPE OF OR PRECLUDE LIMITATIONS OR EXCLUSION OF REMEDIES OR DAMAGES, OR OF LIABILITY, SUCH AS LIABILITY FOR GROSS NEGLIGENCE OR WILLFUL MISCONDUCT OR DO NOT ALLOW IMPLIED WARRANTIES TO BE EXCLUDED, THE LIMITATION OR EXCLUSION OF WARRANTIES, REMEDIES, DAMAGES OR LIABILITY SET FORTH ABOVE ARE INTENDED TO APPLY TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW. CUSTOMER MAY ALSO HAVE OTHER RIGHTS THAT VARY BY STATE, COUNTRY OR OTHER JURISDICTION.</p> <p style="text-align: center;">*****</p>
---	---



**TROX USA, Inc.**

4305 Settingdown Circle  
Cumming, Georgia 30028

Phone: 770.569.1433  
Fax: 770.569.1435

E-Mail: [trox@troxusa.com](mailto:trox@troxusa.com)  
[www.troxusa.com](http://www.troxusa.com)