

Total Restraint Access Module TRAM™ *Innovative Height Safety Technology*

WHY TRAM IS CATEGORISED AS A TOTAL RESTRAINT DEVICE



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1. General

This paper provides the reasoning for the standard TRAM safety system being categorized as a total restraint device.

2. Requirements under Australian and New Zealand Standards

The *definitions* of fall situations and the *hierarchy of control of fall protection* are given in AS 1891 2000 Industrial fall-arrest systems and devices Part 4: Selection, use and maintenance.

Fall Situation Definitions

AS 1891.4 2000 (1.4.5 to 1.4.8) defines fall situations as follows:

Free fall, free fall-arrest

A fall or the arrest of a fall where the fall distance before the fall-arrest system begins to take any loading, is in excess of 600 mm either vertically or on a slope on which it is not possible to walk without the assistance of a handrail or hand line.

Limited free fall, limited free fall-arrest

A fall or the arrest of a fall occurring under the conditions described in Clause 1.4.5 except that under reasonably foreseeable circumstances the fall distance will not exceed 600 mm.

Restrained fall, restrained fall-arrest

A fall or the arrest of a fall where the person suffering the fall is partially restrained by a restraining device such as a pole strap, or is sliding down a slope on which it is normally possible to walk without the assistance of a handrail or hand line.

Total restraint

A control on a person's movement by means of a combination of a belt or harness, a line and a line anchorage which will physically prevent the person from reaching a position at which there is a risk of a free or limited free fall.

Hierarchy of controls

AS 1891.4 2000 (Figure 1.2) gives the hierarchy of control of falls as follows (the highest control measure being at the top of the list):

- Fall restraint
- Work positioning
- Limited free fall arrest / restrained fall arrest
- Free fall arrest

3. Total Restraint

A correlation of the above information provides the requirements of total restraint as being:

A system that controls a person's movement by means of a combination of a belt or harness, a line and a line anchorage which will physically prevent the person from reaching a position at which there is a risk of:

- A free fall, this being where the fall distance before the fall-arrest system begins to take any loading is in excess of 600 mm; or

- A limited free fall, this being a fall or the arrest of a fall occurring under the conditions described for a free fall, except that under reasonably foreseeable circumstances the fall distance will not exceed 600 mm.

4. Free Fall, Falls to a Different Level, and Falls on the Same Level

The AS/NZS 1891 series is currently being rewritten. The first revision of the series is AS/NZS 1891.1, which is now in final draft. In the preface to the Draft for Public Comment, the Committee states its decision to change the *limited free fall* distance from 600mm to 1000mm, and the *free fall* distance to falls of greater than 1000mm.

The Committee has also advised Standfast Corporation (Committee member Chris Turner of WorkCover NSW to National Safety Manager Standfast, 24 Aug 06) that:

- The *free fall* and *limited free* situations currently defined in AS/NZS 1891.4 2000 are only intended to apply to *falls to a different level*,
- *Falls on the same level* are not considered to be *free fall* or *limited free fall* events.
- These ambiguities will be cleared up in the revised Standards.

5. TRAM (Total Restraint Access Module)

TRAM is designed to meet the total restraint requirements of AS/NZS 1891.4. It is constructed in such a way that the combination of the belt, anchorage and rail will not allow a user to fall to another level.

The standard lanyard length is 750mm. This allows the user both an adequate work radius, and the ability to face the direction that they are walking so that they do not need to walk backwards when using the system.

The belt is fitted with two lanyards, one at each side. These are connected to anchor points on the TRAM arm that are spaced at about hip width and at a minimum height of 882 mm, which is about waist or hip height for the user. (The anchor points are typically at about 910mm above the walkway or platform - the variance is due both to the height range of the users and the height range of the mounting equipment, which varies for different applications.).

Because the length of the lanyards (750mm) is less than the height of the anchor points (minimum of 882mm) above the walkway or platform, it is not possible to fall to another level regardless of the width of the walkway or platform. The lanyards will always cause the user to swing back onto the walkway or platform.

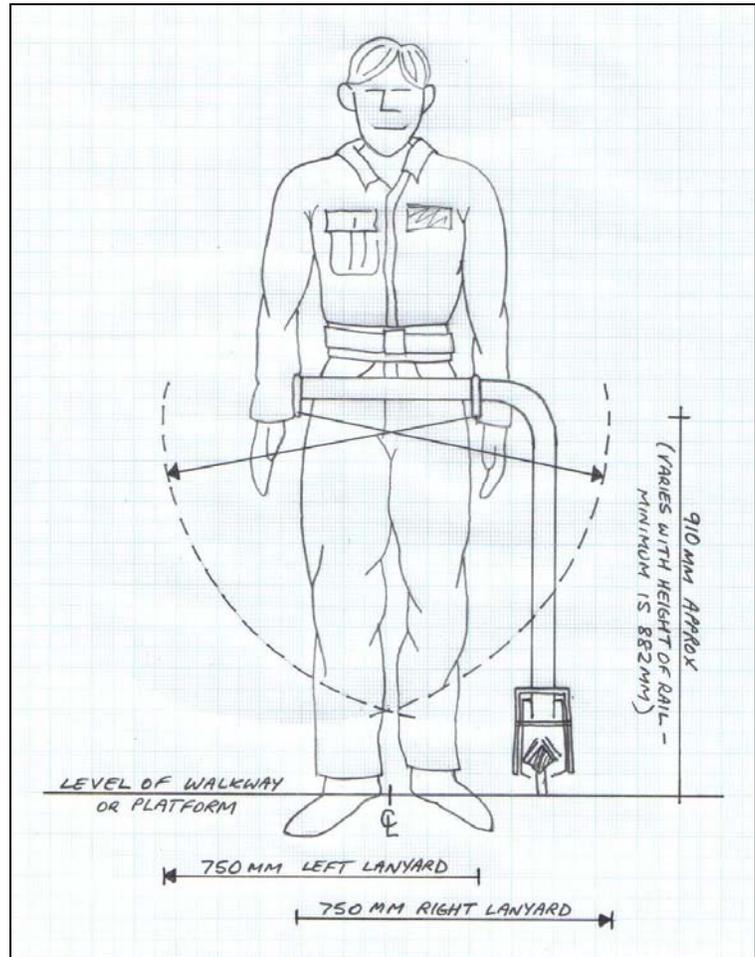


Figure 1. The TRAM System

How the combination of lanyard length and anchor point height prevent a fall to a different level

6. Further Discussion

Each lanyard and anchor point is tested to meet limited fall arrest requirements, so the user can safely connect by only one lanyard to any anchor point to increase the work radius if desired. The system will still swing the user back onto the walkway, though with less control than when two lanyards are used. Normally, the user has the two lanyards attached to the two hip-width-spaced anchor points, and in the event of a fall on the same level this configuration serves to seat the user and swing them back onto the platform or walkway. It could be likened to an anchored pole strap.

This means, for example, that TRAM is an excellent retrofit solution for height safety in such applications as gantry and bridge cranes with narrow maintenance walkways. Even were the user to step off a 300mm wide walkway, the inner lanyard will take up full loading immediately and swing the user back onto the walkway.

7. Conclusion

TRAM's combination of lanyard length and anchor points is designed to prevent falls to a different level. The user will always be brought back into position on the walkway or platform.

TRAM *physically prevents the person from reaching a position at which there is a risk of a free or limited free fall*, as required by the definition of AS/NZS 1891.4 for total restraint devices.

TRAM is therefore a total restraint device as defined by AS/NZS 1891.4 2000 and as confirmed in August 2006 by a representative of the Standards Australia AS/NZS 1891 Committee.

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