Egress Enabler
User Guide

Erik Smedberg[a], Björn Slaug[b], Gunilla Carlsson[b], Giedre Gefenaite[b], Steven M. Schmidt[b], Enrico Ronchi [a]
[a] Division of Fire Safety Engineering, Lund University, Lund, Sweden
[b] Department of Health Science, Lund University, Lund, Sweden

Background
This document serves as a user guide to the Egress Enabler, an evaluation instrument for egressibility developed as a joint effort between the division of fire safety engineering, and the Center for Ageing and Supportive Environments (CASE), both at Lund University.

Components
The Egress Enabler consists of two components, the environmental and the personal, which serves as the basis for the evaluation of egressibility in the analysis phase.

Environmental component
The environmental component contains description of the environmental barriers present in the context under evaluation. These barriers are interpreted as barriers for people with functional limitations to make use of the egress components present in the environment. Ultimately, these barriers may hinder a person to evacuate in a safe and timely manner. In the Egress Enabler, these environmental barriers consist of checklist items that are to be evaluated on a dichotomous scale (yes/no).

Personal component

The personal component describes functional limitations in 14 different domains. These 14 functional limitations are given in table A below.

Table A. Functional limitations in the Egress Enabler.

Functional limitation
A. Difficulty in interpreting information
B1. Severe loss of sight
B2. Complete loss of sight
C. Severe loss of hearing
D. Prevalence of poor balance
E. Incoordination
F. Limitations of stamina
G. Difficulties in moving head
H. Difficulty in reaching with arms
I. Difficulty in handling and fingering
J. Loss of upper extremity skills
K. Difficulty in bending, kneeling, etc.
L. Reliance on walking aids
M. Wheelchair user

Analysis

With the use of the two above mentioned components, an analysis of egressibility is undertaken. Associated with each environmental barrier is a scoring pattern that contains severity ratings for each of the 14 functional limitations. The severity ratings are on a scale from zero to four. The interpretation of each severity rating is given in table B below.

Table B. Severity ratings and interpretation.

Severity rating	**Interpretation**
0	No issues
1	Potential issue
2	Issue
3	Severe issue
4	Impossibility

Note that the severity ratings are put in relation to a person without any functional limitations. That is, if an item is equally difficult for a person without functional limitations, and a person with functional limitation X, the severity rating is 0.

Applying sub-components

In order to make the Egress Enabler flexible to use and applicable for a variety of building designs, a flexible structure is adopted. This involves structuring all items in nine different sub-components, each representing a different egress component. The sub-components need to be applied to evaluate the building. As some egress components are often found more than once in a building's evacuation strategy, the Egress Enabler employs a weighting strategy to make evaluation of different buildings,

with different numbers of egress components, comparable. This essentially means that each sub-component should only be counted once, so that the maximum Egress Enabler score will be the same irrespective of the building being evaluated (apart from buildings that do or do not require vertical evacuation).

This section contains a description of the sub-components, when to apply them, how to weight them, and things to consider when applying them.

Notification systems

The purpose of the notification system is to notify the occupants of the imminent threat. Preferably, the system should do so reliably irrespective of the presence of functional limitations.

The scale should be applied once to every unique notification system. Common is that the notification system is the same throughout a building, and the sub-component can then be applied only once. If there are more than one sub-component applied, they should be weighted according to the number of occupants that is expected to be served by the notification system.

Signage

Signage is used to direct occupants to the emergency exits, as well as provide other information that is useful in the event of an evacuation. This information should reach all occupants of the building.

The scale should be applied once to every unique signage. Common is that the signage is designed similarly throughout a building, and the sub-component can then be applied only once. If there are more than one sub-component applied, they should be weighted according to the number of occupants that is expected to be served by the signage.

Circulation spaces

A circulation space is the horizontal space that makes up the building. Each circulation space is then connected to doors, refuge areas, stairs, refuge areas and/or occupant evacuation elevators.

A circulation space sub-component should be applied at least once per floor (separated by vertical egress components). If two or more circulation spaces are substantially different within a floor, apply more than one sub-component per floor.

The sub-component circulation space contains additional items at the end, items #318-322. These items should only be accounted for once per floor, even though there may be more than one circulation space sub-component per floor.

To weigh the sub-component together, the same principle applies as for notification system and signage. That is, the circulation space sub-components should be weighted according to their expected usage counted in number of occupants.

Refuge areas

The purpose of a refuge area is to provide a safe place for people who cannot evacuate otherwise to stay and wait for help from the fire and rescue services or similar.

Apply one sub-component per refuge area and weigh them together according to their expected usage.

Occupant evacuation elevators

Occupant evacuation elevators are supplied as a means of vertical evacuation. Important to note is that occupant evacuation elevators are specifically designed to be used during evacuations and are hence not to be confused with regular non-emergency elevators.

Apply one sub-component per occupant evacuation elevator and weigh them together according to their expected usage.

Ramps

Ramps are supplied as a means of vertical evacuation. Only ramps that are used in the evacuation strategy should be evaluated.

Apply one sub-component per ramp and weigh them together according to their expected usage.

Stairs

Stairs are supplied as a means of vertical evacuation. The distinction between a stair and a step is that a stair has more than one step, or a step of at least 10 cm height. Only stairs that are used in the evacuation strategy should be evaluated.

Apply one sub-component per stair and weigh them together according to their expected usage.

Doors

Doors are means of evacuating from one room to another, or from one room to the outside environment. Only doors that are used in the evacuation strategy should be evaluated.

Apply one sub-component per door and weigh them together according to their expected usage.

Outside Environment

The outside environment refers to the area from outside the emergency exit connecting to the outside and to the area of relocation. Buildings typically have stairs or ramps connecting the entrances and exits to the outside. These should be regarded as stairs or ramps in the evaluation and not part of the outside environment under certain circumstances. If it is possible for a person to relocate to a safe distance from the building without using the stair or ramp, the stair or ramp should not be evaluated as stair or ramp. Instead, they should be a part of the outside environment evaluation.

Apply one sub-component per uniquely designed path from exits to the area of relocation and weigh them together according to their expected usage.

Analyzing results

The results from an evaluation using the Egress Enabler can be visualized in different ways. First, there are two different ways to visualize the yielded score: Egress Enabler score (EES), and a star rating. Secondly, there is an option to present the results as an average of all functional limitations, or individually for all functional limitations.

Egress Enabler score

The Egress enabler score presents the sum of all individual scores associated with the environmental barriers that are present. The maximum score is 1314 for all functional limitations combined. The maximum score for each functional limitation is given by the following scoring pattern: [A:81,

B1:141, B2:162, C:28, D:130, E:115, F:82, G:14, H:20, I:27, J:35, K:40, L:209, M:230]. A higher score means that more egressibility issues were found. The Egress Enabler score is divided by all functional limitations to make it easier to identify where egressibility issues exists. A simple example of how the Egress Enabler scores should be aggregated is provided in table C below. On the last row, the aggregated score for each functional limitation (A-M) is presented. In the rightmost column on the last row, the total Egress Enabler score is presented. Note that it is only the scoring patterns of those items that have been evaluated (marked with an x) in the grey cells that are used in the calculation of the score. The grey cell represents the non-compliant answer option.

Table C. Example of aggregating Egress Enabler scores.

	Yes	No	A	B1	B2	C	D	E	F	G	H	I	J	K	L	M	
Item 1	x		1	2	1			2	2		1		2		1	3	
Item 2		x		3		2	2		1	1		2	3	1			
Item 3		x	2		2		1	1		2	2			1	2		
Results			*1+2*	*2*	*1+2*	*0*	*1*	*2+1*	*2*	*2*	*1+2*	*0*	*2*	*1*	*1+2*	*3*	*∑28*