

CADS Footfall Analysis

ANALYSIS, MODELLING & DESIGN

ENGINEERING SOFTWARE



Overview

CADS Footfall Analysis (CFA) is post-processing software that can be used in conjunction with **Dlubal RFEM** and **SCIA Engineer** to provide footfall response analysis calculations. Footfall response is of interest to users concerned about the vibration induced in their structures due to walking related activities.

As advances in structural design result in more efficient and lighter irregular structures, sensitivity to vibration of the structures is becoming increasingly significant.

Solution

There is a known complexity of calculating footfall response on irregular floors or staircases of any type. CADS Footfall Analysis uses part of Dlubal RFEM and SCIA Engineer's modal analysis results to predict the vibration levels at all locations on a floor. A rigorous analysis method is essential to enable an accurate investigation of the dynamic behaviour of the floor. The software incorporates the most up to date analysis procedures allowing the user to select between the two most used calculation methods available, namely the Concrete Centre Method (CCIP-016) and the Steel Construction Institute Method (P354).

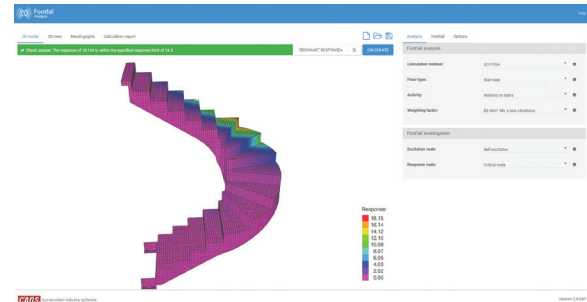
Benefits

- CFA links with Dlubal RFEM and SCIA Engineer, using the model geometry from there, thus the user is not required to create a second model specifically for footfall analysis
- Allows the user to analyse any type of structure for footfall analysis, irrespective of the shape, material or use
- Quick and accurate predictions of resonant and impulsive (transient) responses
- Cumulative measurement of vibration levels – VDV analysis
- Intuitive output enabling the engineer to advise of improvements of critical areas in a cost-effective way
- Pass/fail limit check in accordance with BS 6472 and ISO 10137

Features

Calculation methods

- Concrete Centre Method – CCIP-016 – A Design Guide for Footfall Induced Vibration of Structures
- The Steel Construction Institute Method – SCI P354 – Design of Floors for Vibration: A New Approach



Main window layout

Analysis Footfall Options

Footfall analysis

Calculation method: CCIP-016

Forcing functions: AISC Design Guide 11

Floor type: General (office, workshop)

Activity: Walking

Weighting factor: 1

Footfall investigation

Excitation node: Self excitation

Response node: Critical node

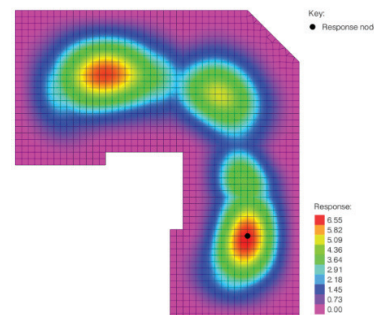
Analysis input

Results summary

Floor type	Activity	Environment	Response limit	Overall response	Result
General (office, workshop)	Walking	Workshop	8	6.546	Pass

✓ The check has passed: The response of 6.546 is within the specified response limit of 8.0.

Overall response



	Node	Nodal mass (kg)	Response
Critical node for resonant calculation	1289	168.71	6.546
Critical node for impulsive calculation	1444	168.71	3.746

Footfall options

- Choice of excitation forces: CCIP-016, SCI P354, AISC DG I I for floors and stairs
- Frequency weighting curves (BS 6841)
- Quick investigation for full model or specific areas
- Vibration Dose Analysis (VDV)
- Adjust the minimum and maximum walking frequency as well as the walker's weight
- User input damping values
- Vary the number of footfalls for resonant response, user input or software calculated
- Environmental response limit based on BS 6472 and ISO 10137

Analysis Footfall Options

Parameters

Min. walking frequency: 1.6 Hz

Max. walking frequency: 2.2 Hz

Walker weight: 750 N

Damping factor, ζ : 0.02

Number of footfalls: 100

☐ Calculate number of footfalls

VDV analysis

☐ Perform vibration dose value (VDV) analysis

Response limit

Environment: Environment

Response limit: Place

Place	Factor
Critical working area	1
Residential - day	2-4
Residential - night	1.4
Quiet office, open plan	2
General office, school	4
Workshop	8
Staircase - light use	32
Staircase - heavy use	24

Footfall input

Output

- Overall maximum response factors and critical nodes
- Resonant analysis (maximum response factor, RMS acceleration, critical node, critical frequency)
- Impulsive (transient) analysis (maximum response factor, peak acceleration/velocity, RMS acceleration/velocity, critical node, critical frequency)
- Vibration dose values for both resonant and impulsive analyses

VDV analysis

☒ Perform vibration dose value (VDV) analysis

Activity duration: 10 s

Number of occurrences per hour: 150

VDV limit

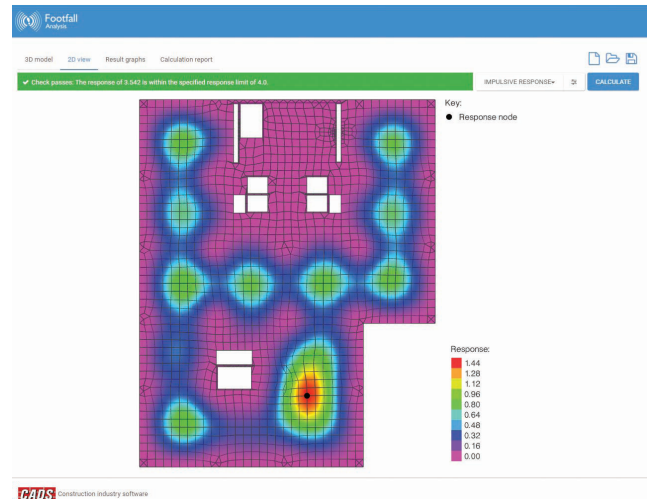
Environment: Office general

Occurrence duration: 16 hours

Low VDV limit: 0.4

Adverse VDV limit: 0.8

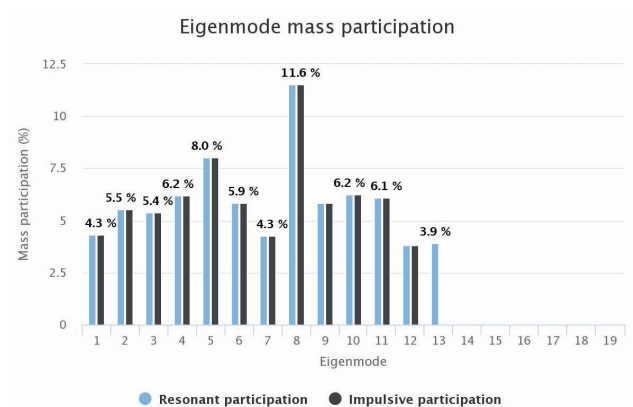
VDV



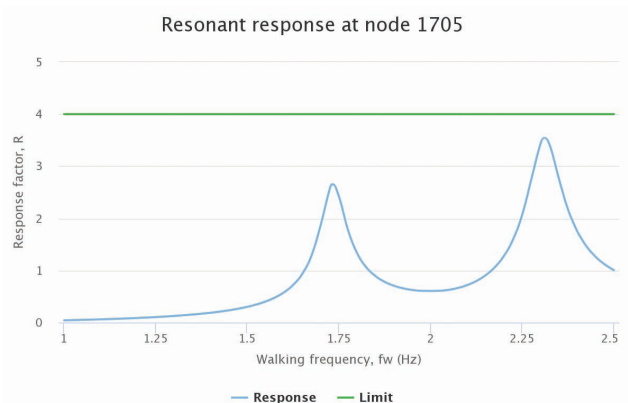
Floor response map

Charts

- Response factor vs walking frequency
- Mass participation vs eigenmodes
- Velocity time history



Eigenmode mass participation graph



Resonant response vs walking frequency