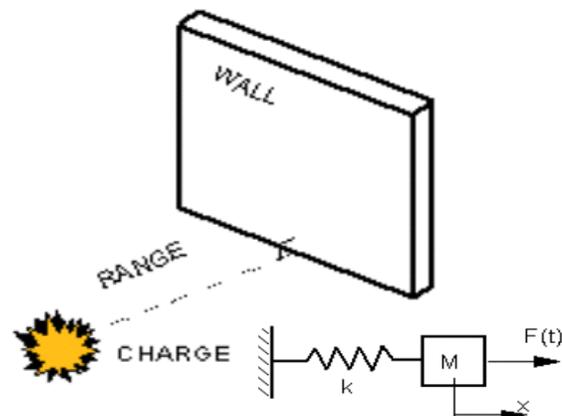


# Single-degree of freedom Plastic Analysis (SPAN)

## BACKGROUND

SPAN is the product of many years of development. It was developed as an in-house Single-Degree-of-Freedom code to aid in the design and analysis of structural members subjected to dynamic loads. SPAN was written originally for design and analysis of hardened structural members subjected to high explosive loadings. These dynamic loads can be generated from any type of explosion that results in a uniform load on the face of the member. The uniform loading could be any of the following types; air blast, or ground shock. It performs an equivalent single degree of freedom dynamic analysis of the response of a structural member. It is a useful tool in analysis of conventional construction subjected to any uniform dynamic load. SPAN is currently version 1.3.0.0 and is limited distribution, critical technology.



$$\frac{d^2}{dt^2}x(\text{Mass member} + \text{Mass Attached}) + c\frac{d}{dt}x + K \cdot x := \text{Pres}_i + F_{\text{static}}$$

## CAPABILITIES

Current capabilities of the SPAN include:

- Analysis of one-way and two-way Steel members
- Analysis of one-way and two-way Reinforced Concrete members
- User Defined member
- Accounts for both positive and negative resistance
- Hysteresis effects accounted for
- Virtually any uniform dynamic loading
- Soil Media Interaction model for Ground Shock
- Dynamic Data Exchange with Dplot for plots
- MS Windows Graphical User Interface (GUI)
- Dynamic Link Library version (used in AutoDesigner)
- DOS version
- Structural Analysis
- Help File

## FUTURE OF SPAN

Future enhancements to be added to SPAN include:

- 12 steel model for reinforced concrete to provide more accurate support condition, and reinforcement layout
- Accounting for the effects of openings in a slabs and the resulting yield lines.
- A user defined multi-step resistance function
- Improve numerical analysis, replacing current linear acceleration methods.
- Addition of Kingery-Bulmash air blast generation with positive and negative phase.
- Integration of Wall Analysis Code models.
- Improved Help files and Documentation
- Generation of Pressure-Impulse curves for given response.

## OUTPUT

Input/Output summary containing the program input and summary response output printed to ASCII file and also displayed on the SPAN screen. Input/Output full response data, containing the program input and full response data. The full response data in columnar format contains all the response data for the given project and may be several hundred pages in length, this is the same data that is available for graphical output. Graphical output is plotted with Dplot include blast load pressure, blast load impulse, resistance vs. displacement, resistance vs. time, displacement vs. time, velocity vs. time, and acceleration vs. time.

## POINT OF CONTACT

U.S. Army Corps of Engineers  
Protective Design Center

Internet Website:

Web Page: <https://pdc.usace.army.mil/software/span>  
Help Page: <https://pdc.usace.army.mil/software/span/help>  
Email: <mailto:PDC.Web@usace.army.mil>

SIPRNet Website:

Web Page: <https://usace-pdc.army.smil.mil/software/span>  
Project Page: <https://usace-pdc.army.smil.mil/software/span/help>  
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