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DESIGN AND ANALYSIS OF CIRCULAR SILO (R.C.C) FOR STORING BULK MATRIALS

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Abstract

Abstract- In this recent era of competition in industries India, which is becoming a rising nation in industries like ceramics, cement industry and textiles, etc. still there is a requirement of modification of storing raw materials in this product type industry. Manual design of circular silo for various material and also done .net programming for different material storing in silo & check pressure and design of reinforcement in this paper. Also done a comparison between manual design and.net programming. In both designs, influence of different parameters discussed.

Keyword- silo, .net(VB), hoop stress, longitudinal stress, silo wall, hopper bottom

I. INTRODUCTION

Structure for the storage of solids is generally referred to by the name Bin. A bin is simply an upright container and the name includes shallow containers known as bunkers and tall structure known as silo. Steel bin usually rectangular or circular in cross section and are supported on column or skirts as shown in figure1.bin type structures used for cement, grains, coal etc. They are generally used for bulk storage in vertical direction of a wide range of materials varying in bulk density, particle size and angle of repose.

Reinforced concrete bins usually rectangular but tall silos are cylindrical. Normally 500 to 2000 tons of granular material is stored in single bin and large quantities of the order of 10000 tone of more are to be stored the material is divided into two or more bins forming a continuous nest or Battery.

II. OBJECTIVE AND SCOPE OF STUDY

Design of RCC circular silo depend upon the type of material,material density, angle of repose, horizontal pressure on side wall or silo, H/D ratio. So main objective of study of comparison between manual design and design in .NET.

1) To study the IS 4995- 1974 part-I & Part-II for general requirements and assessment of bin loads and design criteria.
2) To study the h/d ratio in the analysis of horizontal pressure at different height.
3) Design of silo for various type of material by considering h/d fixed.
4) Another objective is to develop a .NET programming which gives the complete analysis of wall pressure at different height and for different material of different density.
5) To study of Comparison between result of manual and software based data.

III. COMPARISSION BETWEN CODAL AND .NET

PROBLEM DATA : R.C.C. CIRCULAR SILO DESIGN & ANALYSIS

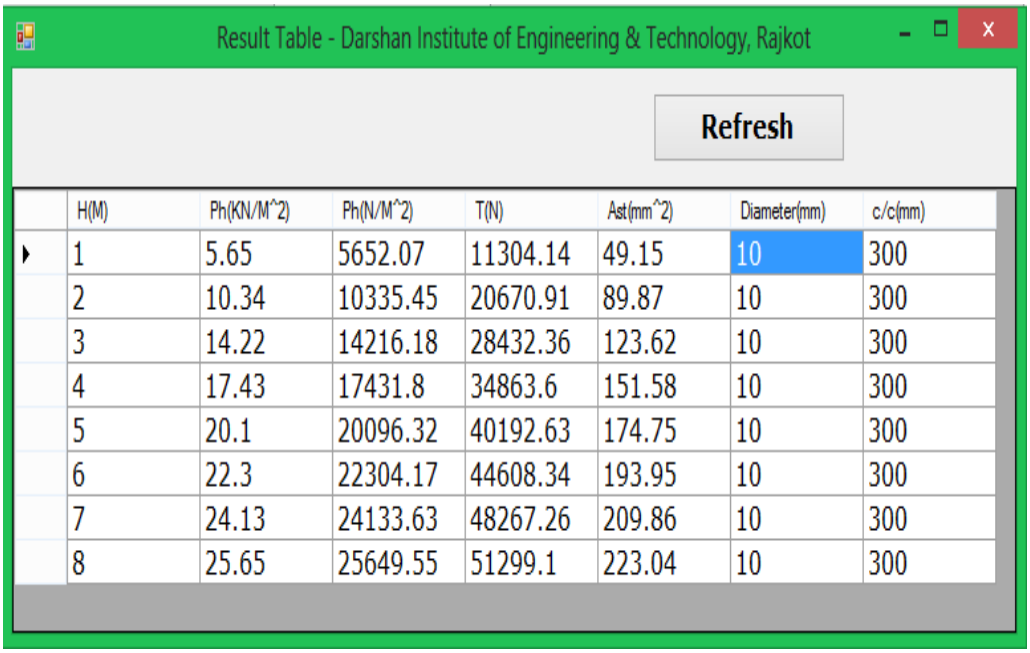
Material = Cement
Capacity = 90 tone
Angel of internal friction ¢ = 25˚ (IS 4995-I 1974)
Density of granular material = 15.50 KN/m2
Conical hopper bottom slope = 45˚
Opening at bottom is = 500 mm
Hopper bottom height = 3 m

PRESSURE CALCULATION AS PER JENNSEN`S THOERY FOR CEMENT MATERIAL

Table:1 MANUAL PRESSURE CALCULATION (jennsen`s theory)

Height h. M	Ph=WR/μ'(1-e^- μ'kh/R) KN/M^2	Ph in N/m^2	Hoop Tension T=Ph*D/2 N	Area of Steel= T/230 mm^2	Dia of Steel in mm	c/c mm
1	5.456	5456	10912	47.44	10	300
2	10.059	10059	20118	87.47	10	300
3	13.942	13942	27884	121.23	10	300
4	17.219	17219	34438	149.73	10	300
5	19.983	19983	39966	173.77	10	300
6	22.315	22315	44630	194.04	10	300
7	24.252	24282	48564	211.15	10	300
8	25.942	25942	51884	225.58	10	300

Table : 2. PRINT SCREEN OF PRESSURE CALCULATION FROM DEVELOPED PROGRAM (.SNET)

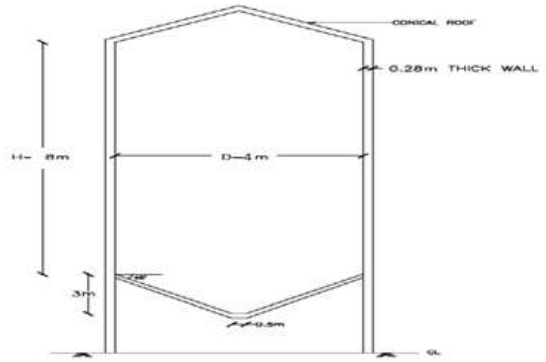


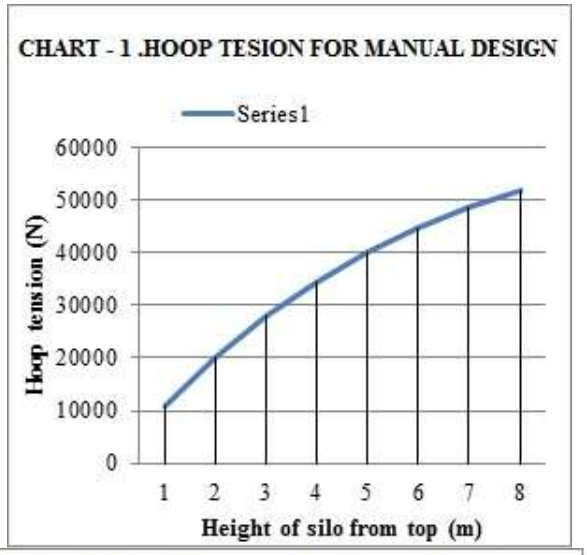
H(M)	Ph(KN/M^2)	Ph(N/M^2)	T(N)	Ast(mm^2)	Diameter(mm)	c/c(mm)
1	5.65	5652.07	11304.14	49.15	10	300
2	10.34	10335.45	20670.91	89.87	10	300
3	14.22	14216.18	28432.36	123.62	10	300
4	17.43	17431.8	34863.6	151.58	10	300
5	20.1	20096.32	40192.63	174.75	10	300
6	22.3	22304.17	44608.34	193.95	10	300
7	24.13	24133.63	48267.26	209.86	10	300
8	25.65	25649.55	51299.1	223.04	10	300

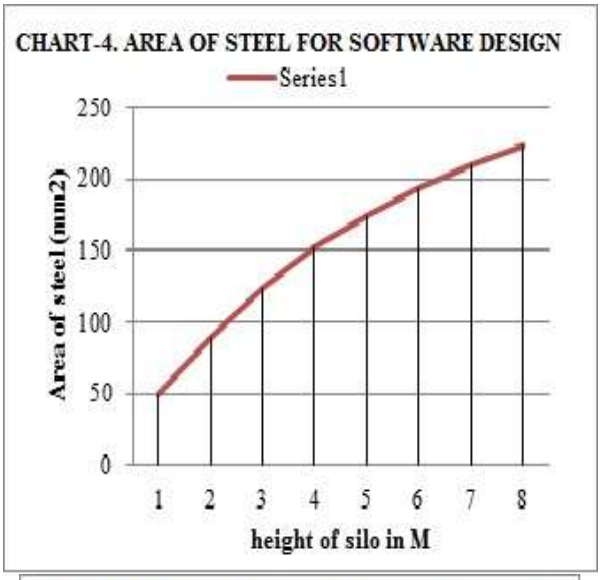
Table : 3 COMPARISION MANUAL AND PROGRAMING (.NET)

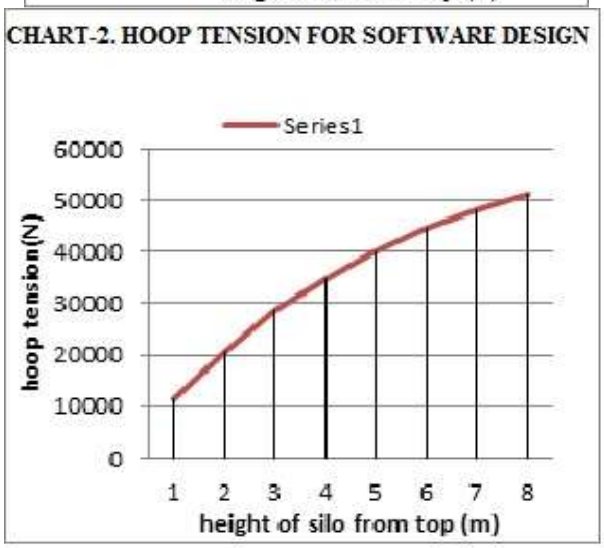
Height h(m)	Hoop Tension T=Ph*D/2 (N)		Area of Steel (mm^2)	
	Manual	Software	Manual	Software
1	11304	11304.1	49.15	49.15
2	20670	20670.9	89.87	89.87
3	28432	28432.4	123.6	123.62
4	34863	34863.6	151.6	151.58
5	40192	40192.6	174.8	174.75
6	44608	44608.3	194	193.95
7	48267	48267.3	209.9	209.86
8	51299	51299.1	223	223.04

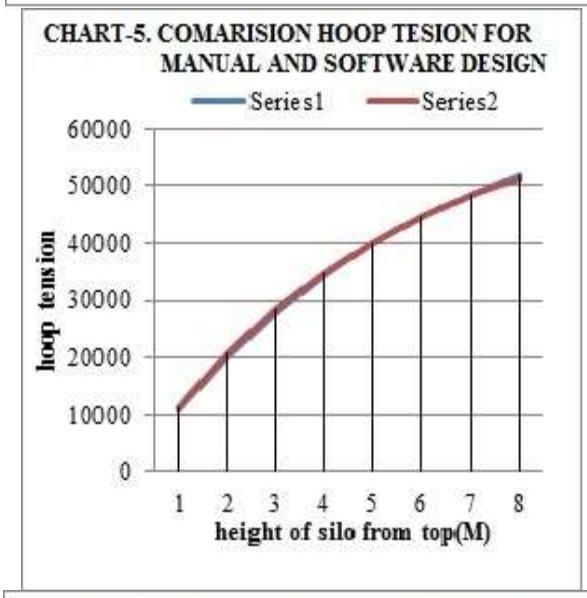
Fig : 1 SILO PROFILE

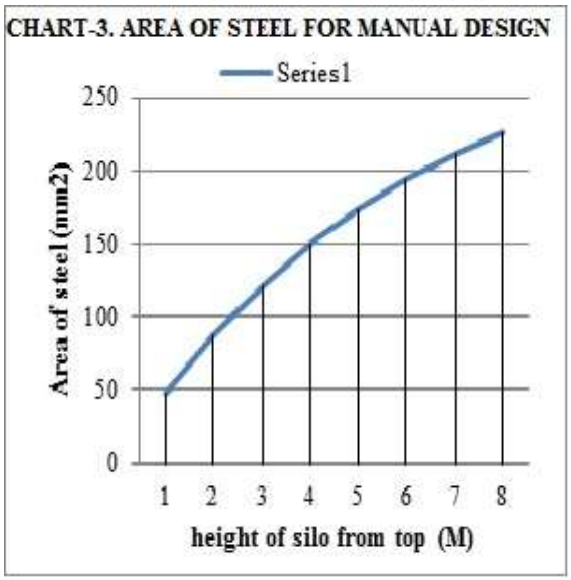


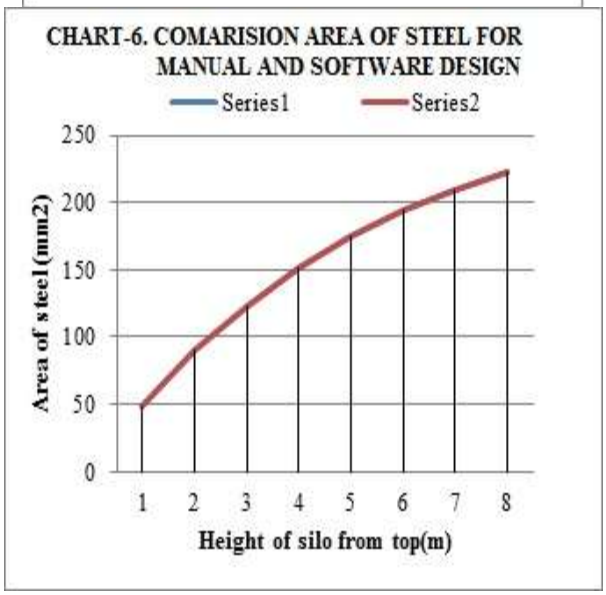












IV. CONCLUSION

- The same result of stress and area of steel has been found during comparison of manual design and .net (VB) programming.
- When increasing height and diameter ratio decrease thickness of wall.
- it is concluded that, ease to various results of various material storing in silo in Design of .net(VB) programming.

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