iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** IV **Month of publication:** April 2019

DOI: https://doi.org/10.22214/ijraset.2019.4188

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

Effective Management of Construction Material Using Inventory Control Techniques on Commercial Building Project

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Abstract: ***Inventory is important especially in construction project as the proper amount of inventory will ensure that all construction activities will be able to carry out according to the planned schedules. . Majority of companies, business and organization has suffered with improper application of material management techniques. Nearly 60% of money is allotted for the inventory in a project.***
The main objective of this research is to study the existing material management system of commercial building. Finally to implement a material management system with application of various inventory control techniques. There are many modern control techniques are available like Always Better Control(ABC), Economical order Quantity(EOQ), Fast-moving slow-moving Non-moving(FSN), High Medium Low(HML), XYZ, Seasonal off seasonal(SOS), Vital Essential Desirable(VED), Government ordinary local foreign(GOLF), Scare Difficult Easily(SDE) Analysis.
The main focus on this research is ABC Analysis, HML Analysis, FSN Analysis, VED Analysis, ABC-VED combination approach.
Keyword: Inventory management, Material management, ABC Analysis, HML Analysis, FSN Analysis, VED Analysis, ABC-VED combination approach.

I. INTRODUCTION

India has been rapidly growing in construction sector. For the past few years the concept of inventory systems gained more importance in our country.
It is due to intense competition in the market, which has forced organizations to search for proper inventory control technique to reduce investment in inventories and thereby reducing overall cost. The market size of Indian construction industry around 248,000 crore rupees and India is a second largest sector.
GDP from construction in India increased to 2413.76INR billion in first quarter of 2018.Civil engineer market size is expected to reach USD 11.72 trillion by 2025; according to new research report by Global market insight. Inventory management is the soul of Materials Management, aims at optimisation of inventory investment to ensure material are available in continuous. Construction sector plays a pivotal role in economic growth of a nation especially in an emerging one like India. The term 'inventory' can be defined as,
"The term inventory includes materials like – raw, in process, finished packaging, spares and others; stocked in order to meet an unexpected demand or distribution in the future. "Inventory control is the course along activities with the purpose of getting to the right inventory in the right place at the right time and in the right quantity. Construction project process like planning, organizing, executing, monitoring, controlling and it depends on factor like time, cost, quality, safety.

II. METHODOLOGY

The use of ABC, HML, FSN, VED Analysis and ABC-VED combination is considered for the case study of the commercial building project. The material management had played an important role in terms of cost saving and time saving project. In an commercial building project there are various materials in use which can be classified differently by their use, rate, importance etc. the ABC, HML, FSN, VED analysis, ABC-VED approach helps in categorizing materials on the basis of consumption value of item, Unit price of the material, Consumption rate or issues of inventory, Criticality of the items, annual usage and criticality of item. In this study we will concentrate on ABC, HML, FSN, VED Analysis and ABC-VED combination approach. Data will be collected from construction project situated at Aravalli district.

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A. (Always Better Control) ABC Analysis:

The ABC analysis classifies the material item based on the Annual Usage Value of items in order to determine its priority among plenty of material items.

The ABC analysis is used to identifying material items that has a highest impact on overall inventory cost. In this method materials are divided into three Groups. I.e. A, B and C Group. It is based on the Pareto Principle which states that "80% of the overall consumption value is based on only 20% of total items".

The analysis is carried out on this following manner: the unit cost and the annual demand is collected and then multiplying the unit cost with the annual demand will provide us the net cost. Than the sum of the items is calculated and the sum of the usage from which the cumulative percentage is obtained and the items are categorized into:

1) *A-Class Items:* items accounting about 60-70% of total consumption value and 10-20% of total items.
2) *B-Class Items:* items accounting about 20-30% of total consumption value and 20-25% of total items.
3) *C-Class Items:* items accounting about 10-20% of total consumption value and 60-70% of total items.

B. (High Medium Low) HML Analysis:

Materials vary in terms of their prices which can be categorized by HML into three categories High price, Medium price and Low price. The managing criteria differ with the change in category. The analysis is to be carried out in the following manner: First calculate the annual demand and annual usage with the help of unit cost of the item. Than calculate percentage of unit cost, cumulative of unit cost and then categories the inventory item. The criteria for categorizing the item can be prepared on the basis of the organization reviews and voting. A parameter is set by the organization for categorizing the item for example:

1) *H- Item:* Items whose unit price is ≥ 10000
2) *M- item:* Items whose price is ≥ 1000 &< 10000
3) *L- item:* Items whose price is < 1000

C. (Fast-moving Slow-moving Non-moving) FSN Analysis

FSN stands for fast moving slow moving and non-moving. Here, classification is based on the pattern of issues from stores and is useful in controlling obsolescence.

FSN analysis is helpful in identifying active items which need to be reviewed regularly and surplus items which have to be examined further.

Non-moving items may be examined further and their disposal can be considered The analysis is to be carried out in the following manner: Prepare the list of items and calculate their unit cost, annual demand, annual usage & Arrange the items in the decreasing order of their annual demand than Calculate the percentage of annual demand & cumulative percentage of annual demand than Classification of inventory item into F, S & N classes. Plot the graph on the basis of cumulative percentage of annual demand & category of FSN.

D. (Vital Essential Desirable) VED analysis

The VED analysis is done to determine the criticality of an item and its effect on production and other services. It is specially used for classification of spare parts.

If a part is vital it is given V classification, if it is essential, then it is given E classification and if it is not so essential, the part is given D classification. For V items, a large stock of inventory is generally maintained, while for D items, minimum stock is enough.

Vital -items without which project comes to standstill. i.e. non availability cannot be tolerated.

Essential- items: items whose non availability cannot be tolerated for 2-3 days, because similar or alternative item are available.

Desirable- items whose non availability cannot be tolerated for a long period.

E. ABC-VED Combination approach

In this combination of annual usage and criticality both will considered. Divided into three part with its amount of stock as below:

AV/BV/CV – High stock required

AE/BE/CE - Moderate stock required

AD/BD/CD – Low stock require

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III. CASE STUDY

A. ABC Analysis

Table: 1 Show qty., Unit price, amount, % of amount, cum % of amount, class

Sr. No	Name of Material	Quantity	Unit Price	Amount	% Of Amount	Cum % Of Amount	Class
1	STEEL	2816236	40	112649440	36.538	36.538	A
2	CC M250	15700	3650	57305000	18.587	55.125	A
3	CC M200	6524	3330	21724920	7.046	62.171	A
4	SAND	34413	400	13765200	4.465	66.636	A
5	BRICK	2598519	5	12992595	4.214	70.850	B
6	CC M100	4493	2500	11232500	3.643	74.493	B
7	CC M150	3120	2980	9297600	3.016	77.509	B
8	M.S.Grills	100053	60	6003180	1.947	79.456	B
9	Louvers	1296	4000	5184000	1.681	81.137	B
10	Green marble stone 20mm thick	1994	2600	5184400	1.682	82.819	B
11	Earth work for embankment 1 KM	21531	180	3875580	1.257	84.076	B
12	CEMENT	12376	300	3712800	1.204	85.280	B
13	Blue Kota stone of size 60 x 45 Cms	5206	550	2863300	0.929	86.209	B
14	Single shutter door "L"section	309	9000	2781000	0.902	87.111	B
15	Glazed Vitrified Tiles 8mm thick in flooring	5574	480	2675520	0.868	87.979	B
16	50 mm thick expansion joint	1772	1500	2658000	0.862	88.841	B
17	METAL	4907	520	2551640	0.828	89.669	B
18	Filling	7728	320	2472960	0.802	90.471	C
19	Wall painting three coats	42996	50	2149800	0.697	91.168	C
20	Double shutter door with "L"section	218	8000	1744000	0.566	91.734	C
21	china mosaic	3435	490	1683150	0.546	92.280	C
22	reinforced polycarbonate sheet roof	1188	1400	1663200	0.539	92.819	C
23	18 mm thick single side mirror finish at staircase	551	2700	1487700	0.483	93.302	C
24	Three track Alluminium window	446	3300	1471800	0.477	93.779	C
25	acrylic lappy (putty)	47006	30	1410180	0.457	94.236	C
26	Dry Powder Type	300	3500	1050000	0.341	94.577	C
27	CO2 Type	300	3500	1050000	0.341	94.918	C
28	Two track Alluminium window	402	2600	1045200	0.339	95.257	C
29	coloured glazed tiles 6 mm thick	1787	580	1036460	0.336	95.593	C
30	Excavation	6684	150	1002600	0.325	95.918	C
31	CHICKEN MESH	50000	20	1000000	0.324	96.242	C
32	UPVC 160 dia	1360	700	952000	0.309	96.551	C
33	FRP FRAME	195	4500	877500	0.285	96.836	C
34	Expansion Joints by Thioflex 600 polymer	3464	250	866000	0.281	97.117	C
35	glass brick partition	208	3900	811200	0.263	97.380	C
36	railing made of SS 316	656	1200	787200	0.255	97.635	C
37	UPVC 110 dia	1420	400	568000	0.184	97.819	C

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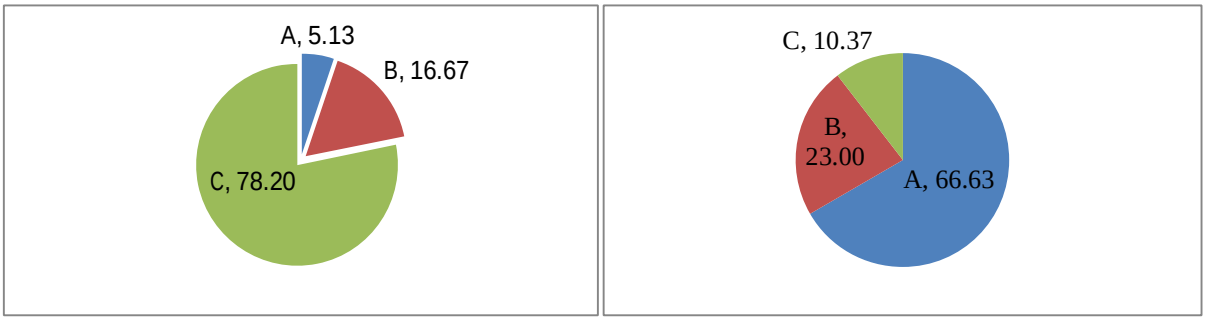
38	Groov in Plaster	50000	10	500000	0.162	97.981	C
39	manhole with R.C.C.top slab	50	10000	500000	0.162	98.143	C
40	steel cupboard	152	3000	456000	0.148	98.291	C
41	collapsible steel shutters	108	4000	432000	0.140	98.431	C
42	CPVC 50 mm	1040	400	416000	0.135	98.566	C
43	steam coal	557	700	389900	0.126	98.692	C
44	WC pan	84	4500	378000	0.123	98.815	C
45	STEEL LETTERS	160	2000	320000	0.104	98.919	C
46	Roller blinds	281	1000	281000	0.091	99.010	C
47	rolling shutter	71	4000	284000	0.092	99.102	C
48	Alluminium sectional ventilators	129	2100	270900	0.088	99.190	C
49	Blue Kotah Stone Slab 25 mm thick	370	700	259000	0.084	99.274	C
50	chemical solution for termite control	4165	55	229075	0.074	99.348	C
51	CPVC 40 mm	845	250	211250	0.069	99.417	C
52	frame work in trusses, purlin	3000	60	180000	0.058	99.475	C
53	Double shutter pivoted door without frame	35	5000	175000	0.057	99.532	C
54	Glazed Vitrified Tiles 8 mm thick in skart	358	480	171840	0.056	99.588	C
55	CPVC 25 mm	949	150	142350	0.046	99.634	C
56	false Ceiling	117	1200	140400	0.046	99.680	C
57	brick masonary chamber	50	2500	125000	0.041	99.721	C
58	white glazed tiles 6 mm thick	173	570	98610	0.032	99.753	C
59	flush pipe	80	1000	80000	0.026	99.779	C
60	VIBRATORY ROLLER	13368	6	80208	0.026	99.805	C
61	Nahni trap	152	450	68400	0.022	99.827	C
62	wash basin with single hole	76	900	68400	0.022	99.849	C
63	hand rail SS 316 , 50 mm dia	188	350	65800	0.021	99.870	C
64	NAME PLATE	300	200	60000	0.019	99.889	C
65	sandwich type plateform	12	4500	54000	0.018	99.907	C
66	Sintex	10000	4.5	45000	0.015	99.922	C
67	cement vata	2192	20	43840	0.014	99.936	C
68	600 mm x 450 mm bevelled edge mirror	76	580	44080	0.014	99.950	C
69	S.W.gully trap	20	1250	25000	0.008	99.958	C
70	Down bib tap 15 mm	128	200	25600	0.008	99.966	C
71	half turn flush cock	72	350	25200	0.008	99.974	C
72	Down stop tap 15 mm	82	220	18040	0.006	99.980	C
73	wheel valve.40 mm	20	700	14000	0.005	99.985	C
74	wheel valve.25 mm	40	400	16000	0.005	99.990	C
75	towel rail	32	480	15360	0.005	99.995	C
76	ball cock	16	350	5600	0.002	99.997	C
77	rough chieseled dressed stone	18	370	6660	0.002	99.999	C
78	Squatting pan	8	500	4000	0.001	100.000	C
				308311138	100.000		

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

Table: 2 Show % of number, cum % of number for ABC Analysis

Class of item	No. of item	% of item	Cum % of Amount
A	4	5.13	66.63
B	13	16.67	23.00
C	61	78.20	10.37
TOTAL	78	100.00	100.00



% of item % of amount

Fig: 1 Show Graph of Number of item, cum % of amount for ABC Analysis

B. HML Analysis

Table: 3 Show Qty., Unit price, amount, % of unit price, cum % of unit price, category

Sr.	Name of Material	Quantity	Unit Price	Amount	% of Unit Price	Cum % of Unit Price	Category
1	manhole with R.C.C.top slab	50	10000	500000	7.988	7.988	H
2	Single shutter door "L"section	309	9000	2781000	7.189	15.177	M
3	Double shutter door with "L"section	218	8000	1744000	6.39	21.567	M
4	Double shutter pivoted door without frame	35	5000	175000	3.994	25.561	M
5	sandwich type plateform	12	4500	54000	3.595	29.156	M
6	WC pan	84	4500	378000	3.595	32.751	M
7	FRP FRAME	195	4500	877500	3.595	36.346	M
8	Louvers	1296	4000	5184000	3.195	39.541	M
9	collapsible steel shutters	108	4000	432000	3.195	42.736	M
10	rolling shutter	71	4000	284000	3.195	45.931	M
11	glass brick partition	208	3900	811200	3.115	49.046	M
12	CC M250	15700	3650	57305000	2.916	51.962	M
13	Dry Powder Type	300	3500	1050000	2.796	54.758	M
14	CO2 Type	300	3500	1050000	2.796	57.554	M
15	CC M200	6524	3330	21724920	2.66	60.214	M
16	Three track Alluminium window	446	3300	1471800	2.636	62.850	M
17	steel cupboard	152	3000	456000	2.393	65.243	M
18	CC M150	3120	2980	9297600	2.38	67.623	M
19	18 mm thick single side mirror finish at staircase	551	2700	1487700	2.157	69.780	M

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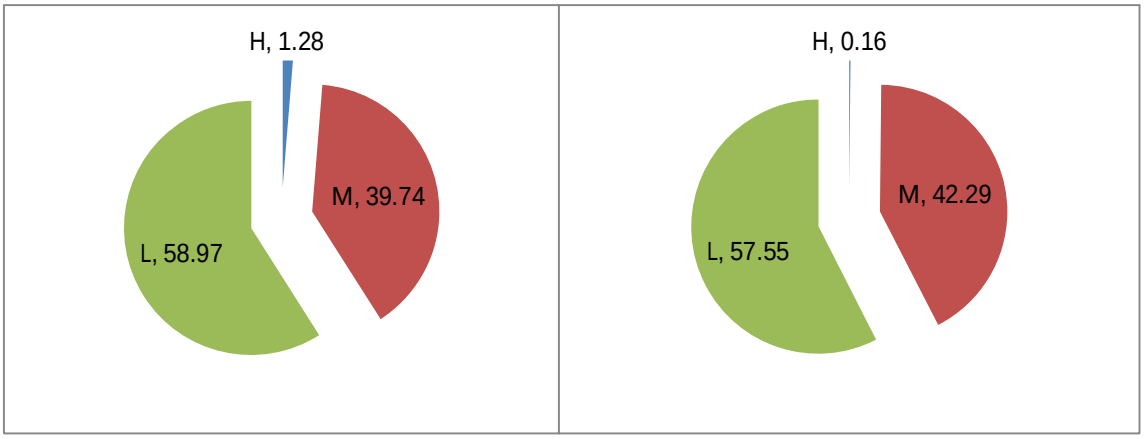
20	Green marble stone 20mm thick	1994	2600	5184400	2.077	71.857	M
21	Two track Alluminium window	402	2600	1045200	2.077	73.934	M
22	CC M100	4493	2500	11232500	1.997	75.931	M
23	brick masonary chamber	50	2500	125000	1.997	77.928	M
24	Alluminium sectional ventilators	129	2100	270900	1.677	79.605	M
25	STEEL LETTERS	160	2000	320000	1.598	81.203	M
26	50 mm thick expansion joint	1772	1500	2658000	1.198	82.401	M
27	reinforced polycarbonate sheet roof	1188	1400	1663200	1.118	83.519	M
28	S.W.gully trap	20	1250	25000	0.998	84.517	M
29	false Ceiling	117	1200	140400	0.959	85.476	M
30	railing made of SS 316	656	1200	787200	0.959	86.435	M
31	Roller blinds	281	1000	281000	0.799	87.234	M
32	flush pipe	80	1000	80000	0.799	88.033	M
33	wash basin with single hole	76	900	68400	0.719	88.752	L
34	wheel valve.40 mm	20	700	14000	0.559	89.311	L
35	Blue Kotah Stone Slab 25 mm thick	370	700	259000	0.559	89.870	L
36	steam coal	557	700	389900	0.559	90.429	L
37	UPVC 160 dia	1360	700	952000	0.559	90.988	L
38	coloured glazed tiles 6 mm thick	1787	580	1036460	0.463	91.451	L
39	600 mm x 450 mm bevelled edge mirror	76	580	44080	0.463	91.914	L
40	white glazed tiles 6 mm thick	173	570	98610	0.455	92.369	L
41	Blue Kota stone of size 60 x 45 Cms	5206	550	2863300	0.439	92.808	L
42	METAL	4907	520	2551640	0.415	93.223	L
43	Squatting pan	8	500	4000	0.399	93.622	L
44	china mosaic	3435	490	1683150	0.391	94.013	L
45	Glazed Vitrified Tiles 8mm thick in flooring	5574	480	2675520	0.383	94.396	L
46	Glazed Vitrified Tiles 8 mm thick in skirting	358	480	171840	0.383	94.779	L
47	towel rail	32	480	15360	0.383	95.162	L
48	Nahni trap	152	450	68400	0.359	95.521	L
49	SAND	34413	400	13765200	0.32	95.841	L
50	UPVC 110 dia	1420	400	568000	0.32	96.161	L
51	CPVC 50 mm	1040	400	416000	0.32	96.481	L
52	wheel valve.25 mm	40	400	16000	0.32	96.801	L
53	rough chieseled dressed stone	18	370	6660	0.296	97.097	L
54	ball cock	16	350	5600	0.28	97.377	L
55	half turn flush cock	72	350	25200	0.28	97.657	L
56	hand rail SS 316 , 50 mm dia	188	350	65800	0.28	97.937	L
57	Filling	7728	320	2472960	0.256	98.193	L
58	CEMENT	12376	300	3712800	0.24	98.433	L
59	Expansion Joints by Thioflex 600 polymer	3464	250	866000	0.2	98.633	L

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60	CPVC 40 mm	845	250	211250	0.2	98.833	L
61	Down stop tap 15 mm	82	220	18040	0.176	99.009	L
62	Down bib tap 15 mm	128	200	25600	0.16	99.169	L
63	NAME PLATE	300	200	60000	0.16	99.329	L
64	Earth work for embankment 1 KM	21531	180	3875580	0.144	99.473	L
65	Excavation	6684	150	1002600	0.12	99.593	L
66	CPVC 25 mm	949	150	142350	0.12	99.713	L
67	frame work in trusses, purlin	3000	60	180000	0.048	99.761	L
68	M.S.Grills	100053	60	6003180	0.048	99.809	L
69	chemical solution for termite control	4165	55	229075	0.044	99.853	L
70	Wall painting three coats	42996	50	2149800	0.04	99.893	L
71	STEEL	2816236	40	112649440	0.032	99.925	L
72	acrylic lappy (putty)	47006	30	1410180	0.024	99.949	L
73	CHICKEN MESH	50000	20	1000000	0.016	99.965	L
74	cement vata	2192	20	43840	0.016	99.981	L
75	Groov in Plaster	50000	10	500000	0.008	99.989	L
76	VIBRATORY ROLLER	13368	6	80208	0.005	99.994	L
77	BRICK	2598519	5	12992595	0.004	99.998	L
78	Sintex	10000	4.5	45000	0.004	100.002	L
			125191	308311138			

Table: 4 Show item used, % of item used, annual usage, % of annual usage

Category	Item used	% of Item Used	Annual usage (Amount)	% of Annual Demand(Amount)
H	1	1.28	500000	0.16
M	31	39.74	130376520	42.29
L	46	58.97	177434618	57.55
TOTAL	78	100.00	308311138	100.00



% of item used % Of Amount

Fig: 2 Show Pie chart of % of item used, %of amount for HML Analysis

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C. FSN Analysis

Table: 5 Show Qty., unit price, amount, % of qty., cum % of qty., class

Sr.	Name Of Material	Quantity	Unit Price	Amount	% of Qty.	Cum % Of Qty.	Class
1	STEEL	2816236	40	112649440	47.7819	47.7819	F
2	BRICK	2598519	5	12992595	44.088	91.8699	F
3	M.S.Grills	100053	60	6003180	1.6976	93.5675	S
4	CHICKEN MESH	50000	20	1000000	0.8483	94.4158	S
5	Groove in Plaster	50000	10	500000	0.8483	95.2641	S
6	acrylic lappy (putty)	47006	30	1410180	0.7975	96.0616	S
7	Wall painting three coats	42996	50	2149800	0.7295	96.7911	S
8	SAND	34413	400	13765200	0.5839	97.375	S
9	Earth work for embankment 1 KM	21531	180	3875580	0.3653	97.7403	S
10	CC M250	15700	3650	57305000	0.2664	98.0067	S
11	VIBRATORY ROLLER	13368	6	80208	0.2268	98.2335	S
12	CEMENT	12376	300	3712800	0.21	98.4435	S
13	Sintex	10000	4.5	45000	0.1697	98.6132	S
14	Filling	7728	320	2472960	0.1311	98.7443	S
15	Excavation	6684	150	1002600	0.1134	98.8577	S
16	CC M200	6524	3330	21724920	0.1107	98.9684	S
17	Glazed Vitrified Tiles 8mm thick in flooring	5574	480	2675520	0.0946	99.063	N
18	Blue Kota stone of size 60 x 45 Cms	5206	550	2863300	0.0883	99.1513	N
19	METAL	4907	520	2551640	0.0833	99.2346	N
20	CC M100	4493	2500	11232500	0.0762	99.3108	N
21	chemical solution for termite control	4165	55	229075	0.0707	99.3815	N
22	Expansion Joints by Thioflex 600 polymer	3464	250	866000	0.0588	99.4403	N
23	china mosaic	3435	490	1683150	0.0583	99.4986	N
24	CC M150	3120	2980	9297600	0.0529	99.5515	N
25	frame work in trusses, purlin	3000	60	180000	0.0509	99.6024	N
26	cement vata	2192	20	43840	0.0388	99.6412	N
27	Green marble stone 20mm thick	1994	2600	5184400	0.0372	99.6784	N
28	coloured glazed tiles 6 mm thick	1787	580	1036460	0.0303	99.7087	N
29	50 mm thick expansion joint	1772	1500	2658000	0.0301	99.7388	N
30	UPVC 110 dia	1420	400	568000	0.0241	99.7629	N
31	UPVC 160 dia	1360	700	952000	0.0231	99.786	N
32	Louvers	1296	4000	5184000	0.022	99.808	N
33	reinforced polycarbonate sheet roof	1188	1400	1663200	0.0202	99.8282	N
34	CPVC 50 mm	1040	400	416000	0.0176	99.8458	N
35	CPVC 25 mm	949	150	142350	0.0161	99.8619	N
36	CPVC 40 mm	845	250	211250	0.0143	99.8762	N
37	railing made of SS 316	656	1200	787200	0.0111	99.8873	N
38	steam coal	557	700	389900	0.0095	99.8968	N
39	18 mm thick single side mirror finish at staircase	551	2700	1487700	0.0093	99.9061	N
40	Three track Alluminium window	446	3300	1471800	0.0076	99.9137	N
41	Two track Alluminium window	402	2600	1045200	0.0068	99.9205	N

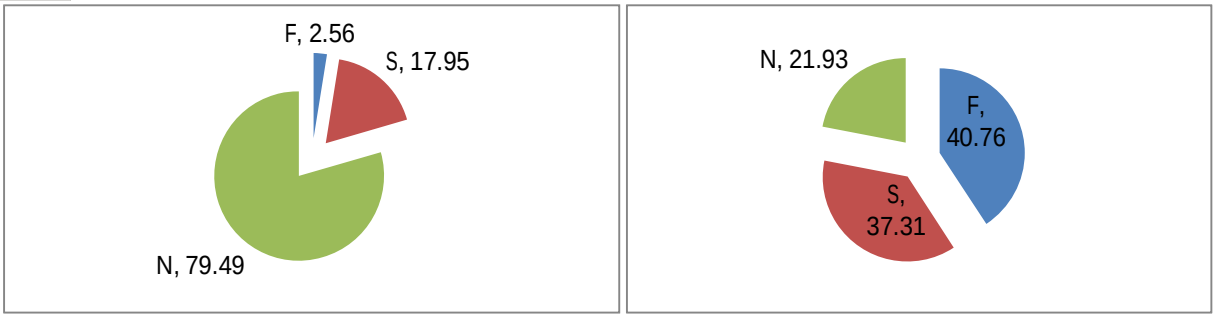
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42	Blue Kotah Stone Slab 25 mm thick	370	700	259000	0.0063	99.9268	N
43	Glazed Vitrified Tiles 8 mm thick in skirting	358	480	171840	0.0061	99.9329	N
44	Single shutter door "L"section	309	9000	2781000	0.0052	99.9381	N
45	Dry Powder Type	300	3500	1050000	0.0051	99.9432	N
46	CO2 Type	300	3500	1050000	0.0051	99.9483	N
47	NAME PLATE	300	200	60000	0.0051	99.9534	N
48	Roller blinds	281	1000	281000	0.0048	99.9582	N
49	Double shutter door with "L"section	218	8000	1744000	0.0037	99.9619	N
50	glass brick partition	208	3900	811200	0.0035	99.9654	N
51	FRP FRAME	195	4500	877500	0.0033	99.9687	N
52	hand rail SS 316 , 50 mm dia	188	350	65800	0.0032	99.9719	N
53	white glazed tiles 6 mm thick	173	570	98610	0.0029	99.9748	N
54	STEEL LETTERS	160	2000	320000	0.0027	99.9775	N
55	Nahni trap	152	450	68400	0.0026	99.9801	N
56	steel cupboard	152	3000	456000	0.0026	99.9827	N
57	Alluminium sectional ventilators	129	2100	270900	0.0022	99.9849	N
58	Down bib tap 15 mm	128	200	25600	0.0022	99.9871	N
59	false Ceiling	117	1200	140400	0.002	99.9891	N
60	collapsible steel shutters	108	4000	432000	0.0018	99.9909	N
61	WC pan	84	4500	378000	0.0014	99.9923	N
62	Down stop tap 15 mm	82	220	18040	0.0014	99.9937	N
63	flush pipe	80	1000	80000	0.0014	99.9951	N
64	600 mm x 450 mm bevelled edge mirror	76	580	44080	0.0013	99.9964	N
65	wash basin with single hole	76	900	68400	0.0013	99.9977	N
66	half turn flush cock	72	350	25200	0.0012	99.9989	N
67	rolling shutter	71	4000	284000	0.0012	100.0001	N
68	manhole with R.C.C.top slab	50	10000	500000	0.0008	100.0009	N
69	brick masonary chamber	50	2500	125000	0.0008	100.0017	N
70	wheel valve.25 mm	40	400	16000	0.0007	100.0024	N
71	Double shutter pivoted door without frame	35	5000	175000	0.0006	100.003	N
72	towel rail	32	480	15360	0.0005	100.0035	N
73	S.W.gully trap	20	1250	25000	0.0003	100.0038	N
74	wheel valve.40 mm	20	700	14000	0.0003	100.0041	N
75	rough chieseled dressed stone	18	370	6660	0.0003	100.0044	N
76	ball cock	16	350	5600	0.0003	100.0047	N
77	sandwich type plateform	12	4500	54000	0.0002	100.0049	N
78	Squatting pan	8	500	4000	0.0001	100.005	N
		5893941		308311138	100.005		

Table: 6 Show class, no of item, % of item, % of amount

Class Of Item	No. of Item	% of Item	Amount	% of Amount
F	2	2.56	125642035	40.76
S	14	17.95	115047428	37.31
N	62	79.49	67621675	21.93
TOTAL	78	100.00	308311138	100.00

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% of Item % of Amount

Fig: 3 Show Pie chart of % of item, % of amount for FSN Analysis

D. VED Analysis

Table: 7 Show activity with Material consumption y

Sr.	Activity	MATERIAL CONSUMPTION
1	RCC	Cement, sand, Admixture, RMC, Polythene sheet, steel, binding weir, Anti-terminate chemical
2	Door & Window	Double shutter pivoted door without frame, Double shutter door with "L"section, FRP FRAME, Single shutter door "L"section , Three track Aluminium window, Two track Aluminium window, Louvers, Aluminium sectional ventilators, collapsible steel shutters, M.S.Grills,
3	Flooring	Glazed Vitrified Tiles 8mm thick in flooring, Glazed Vitrified Tiles 8 mm thick in skirting, Blue Kota stone of size 60 x 45 Cms, Blue Kotah Stone Slab 25 mm thick , white glazed tiles 6 mm thick, 18 mm thick single side mirror finish at staircase , coloured glazed tiles 6 mm thick, chaina mosaic, rough chiselled dressed stone , Green marble stone 20mm thick, cement, sand
4	Masonry & Plaster	Brick, cement, sand, water, scaffolding, chicken mesh
5	Plumbing	CPVC 50 mm, CPVC 40 mm, CPVC 25 mm, UPVC 110 dia, UPVC 160 dia, Down bib tap 15 mm, Down stop tap 15 mm, half turn flush cock, wheel valve.40 mm, wheel valve.25 mm
6	Sanitary	wash basin with single hole , 600 mm x 450 mm bevelled edge mirror , towel rail , WC pan , Nahni trap , S.W.gully trap, ball cock, Syntax , manhole with R.C.C.top slab, flush pip, Squatting pan
7	Formwork	Binding weir, nails, shuttering,
8	Painting	Putty, paint, brush, primer, Barricade tap
9	Electrification	Switches, socket outlet, electric cable, telephone cable, internet cable, plugs, screw, flexing weir, electrical holder & fitting,
10	Fire service	Hydrant system, pump, censor, hose reel, fire extinguisher

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Table: 8 Show activities with vital, essentials, desirable category

Activity	V	E	D
Rcc	RMC, binding weir	Cement, sand, steel, Admixture	Polythene sheet, Anti-terminate chemical
Door & Window	Double shutter door with "L"section , Single shutter door "L"section`	Double shutter pivoted door without frame, Three track Aluminium window, Two track Aluminium window	Louvers, Aluminium sectional ventilators, collapsible steel shutters, M.S.Grills, FRP FRAME
Flooring	Glazed Vitrified Tiles 8mm thick in flooring, Green marble stone 20mm thick, Blue Kota stone of size 60 x 45 Cms	Glazed Vitrified Tiles 8 mm thick in skirting, Blue Kotah Stone Slab 25 mm thick , white glazed tiles 6 mm thick, coloured glazed tiles 6 mm thick, 18 mm thick single side mirror finish at staircase, cement, sand	rough chiselled dressed stone , chaina mosaic
Masonary & Plaster	Brick, water	Cement, sand, scaffolding	Chicken mesh
Plumbing	CPVC 50 mm, CPVC 40 mm, CPVC 25 mm	UPVC 110 dia, UPVC 160 dia	Down bib tap 15 mm, Down stop tap 15 mm, half turn flush cock, wheel valve.40 mm, wheel valve.25 mm
Sanitary	WC pan , Manhol with RCC top slab	Was basin with single hole, 600 mm x 450 mm bevelled edge mirror, Nahni trap , S.W.gully trap, flush pip	towel rail, ball cock, Sintex, Squatting pan
Formwork	Nails, binding weir	Shuttering, cross bracing	
Painting	Putty, brash, paint	Primer	Barricade tap
Electrification	Electrical holder & fittings, screw, switches	Electrical cable, socket outlet, plug, flexible weir	Telephone cable, internet cable
Fire Service	Pump, fire extinguisher	Hydrant system, hose reel	

E. ABC-VED Combination Approach

Table: 9 Show Format of ABC &VED with analysis

Activity			
	V	E	D
A	AV	AE	AD
B	BV	BE	BD
C	CV	CE	CD

Activity 1: RCC			
	V	**E**	**D**
A	RMC	Cement , steel	
B		sand , Admixture	Polythene shee
C	binding weir		Anti-terminate chemical

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Activity 2: Door & Window			
	V	E	D
A			
B	Double shutter door with "L"section , Single shutter door "L"section	Three track Aluminium window, Two track Aluminium window	collapsible steel shutters, M.S.Grills
C		Double shutter pivoted door without frame	Louvers, Aluminium sectional ventilators, FRP FRAME

Activity 3: Flooring			
	V	E	D
A			
B	Blue Kota stone of size 60 x 45 Cms	white glazed tiles 6 mm thick, coloured glazed tiles 6 mm thick	
C	Glazed Vitrified Tiles 8mm thick in flooring, Green marble stone 20mm thick	Glazed Vitrified Tiles 8 mm thick in skirting, Blue Kotah Stone Slab 25 mm thick , 18 mm thick single side mirror finish at staircase	rough chiselled dressed stone , chaina mosaic

Activity 4: Masonry and Plaster			
	V	E	D
A	Brick, Water	Cement , Scaffolding	
B	RCC block	sand	
C			Chicken mesh

Activity 5: Plumbing			
	V	E	D
A			
B		UPVC 110 dia, UPVC 160 dia	
C	CPVC 50 mm, CPVC 40 mm, CPVC 25 mm		Down bib tap 15 mm, Down stop tap 15 mm, half turn flush cock, wheel valve.40 mm, wheel valve.25 mm

Activity 6: Sanitary			
	V	E	D
A			
B			Sintex
C	WC pan, manhole with R.C.C.top slab	wash basin with single hole , 600 mm x 450 mm bevelled edge mirror , Nahni trap, S.W.gully trap, flush pipe	towel rail, ball cock, Squatting pan

Activity7: Formwork			
	V	E	D
A			
B			Shutters
C	nails, binding weir		

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Activity 8: Painting			
	V	**E**	**D**
A	paint		
B			
C	putty, brush	Primer	barricade tape

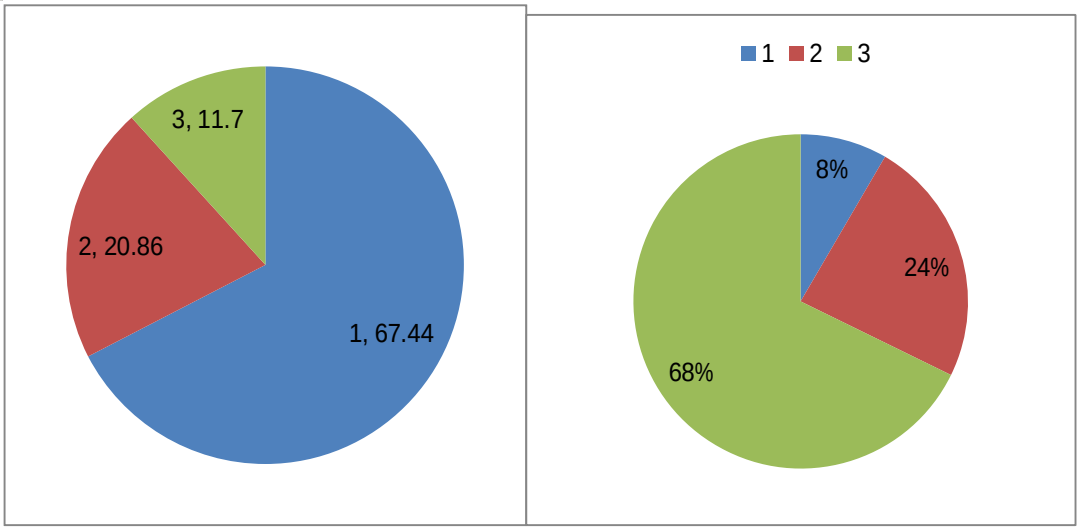
Activity 9: Electrification			
	V	**E**	**D**
A			
B	Switches, electrical holder & fittings		
C	screw	socket outlet, electrical cable, plug, flexible weir	telephone cable, internet cable

Activity 10: Fire Service			
	V	**E**	**D**
A			
B			
C	pump, fire extinguisher	hydrant system, hose reel	Censor

	V	**E**	**D**
A	Brick, RMC , paint	Cement, steel, shuttering	
B	Switches, electrical holder & fittings, Double shutter door with "L"section , Single shutter door "L"section`, Blue Kota stone of size 60 x 45 Cms	Sand, Admixture, Three track Aluminium window, Two track Aluminium window, white glazed tiles 6 mm thick, coloured glazed tiles 6 mm thick, UPVC 110 dia, UPVC 160 dia	Polythene sheet, Sintex, collapsible steel shutters, M.S.Grills
C	binding weir, screw, pump, fire extinguisher, nails, putty, brush, WC pan, manhole with R.C.C.top slab, CPVC 50 mm, CPVC 40 mm, CPVC 25 mm, Glazed Vitrified Tiles 8mm thick in flooring, Green marble stone 20mm thick	Double shutter pivoted door without frame, socket outlet, electrical cable, plug, flexible weir, hydrant system, primer, hose reel, cross bracing, Glazed Vitrified Tiles 8 mm thick in skirting, Blue Kotah Stone Slab 25 mm thick , 18 mm thick single side mirror finish at staircase, wash basin with single hole , 600 mm x 450 mm bevelled edge mirror , Nahni trap, S.W.gully trap, flush pipe	Chicken mesh,Anti-terminate chemical, telephone cable, internet cable, censor, barricade tape, rough chiselled dressed stone , chaina mosaic, Louvers, Aluminium sectional ventilators, FRP FRAME, Down bib tap 15 mm, Down stop tap 15 mm, half turn flush cock, wheel valve.40 mm, wheel valve.25 mm, towel rail, ball cock, Squatting pan

Table: 10 Show ABC &VED Combination analyses

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% of Amount % of Item

Fig: 4 Show pie chart of % of amount, % of item for ABC-VED combination approach

IV. CONCLUSION

An organization can reduce its holding cost and idle storage of material with effective use of material management techniques which ultimately helps in increasing the working capital that can be used in other business of the company. From Always better control (ABC) technique project staff comes to know about cash flow management and future requirement to run the projects smoothly by identifying the items in A, B and C class. It also helps in finding out economical order quantity for particular material.

High Medium Low (HML) Analysis is useful for keeping control over consumption at departmental levels, for deciding the frequency of physical verification, and for controlling purchases. Procurement department is more concerned with prices of materials so this analysis helps them to take them the decisions such as, who will procure what based on the hierarchy and price of material. Some of the other objective can be as under Helps in taking the decision such as whether to procure in exact requirement or optimum for EOQ or purchase only when needed when it is desired to evolve purchasing policies then also HML analysis is carried out.

Fat-moving Slow-moving Non-moving (FSN) Analysis is helpful in identifying active items, which need to be reviewed regularly and surplus items which have to be examined further. Store keeper has maintain data for a date of receipt or last date issue, whichever is letter , is taken to determine the no. of month which has lapsed science last transaction. An understanding of the movement of items helps to keep proper level of inventories by deciding a reordering.

Vital Essential Desirable (VED) Analysis shows that number of item which are very vital in production, there availability to ensure that all items need smooth production and strictly controlled. Essential item follow vital items in hierarchy of importance and Desirable items are least importance in terms of functional consideration, which are loosely controlled at lower level.

ABC-VED combination will be helpful to store the material based on both criticality of operation as well as annual consumption. This analysis prevents the organizations from stock outs. Moreover, it also helps in maintaining smooth flow of material trough out the project life cycle. Not only this, but different combinations like AV, AE, AD and so on showed different level of control on material. It can also save unnecessary storage cost and handling cost for the project materials.

V. ACKNOWLEDGEMENT

First of all I would like to express gratitude to God Almighty for the blessing and kindness in lending me to accomplish my case study. We are very grateful to Mr. Pratik, owner of the Jyoti Infrastructure Pvt. Ltd., Modasa-Gujarat to provide us the Data to carry out our case study. Especially I would like to extend my deepest gratitude to my project study supervisor, Prof. Ankitkumar S. Patel for his sincere guidance and his enormous patience throughout the development of the project. I am very grateful to express my sincere thanks to Mr. Manish Pandya principle of Parul Institute of Technology. In addition I would also like to thank Dr. Shakil S. Malek and Prof. Sumit Phoghat for the valuable remarks, inspiration, and guidance.

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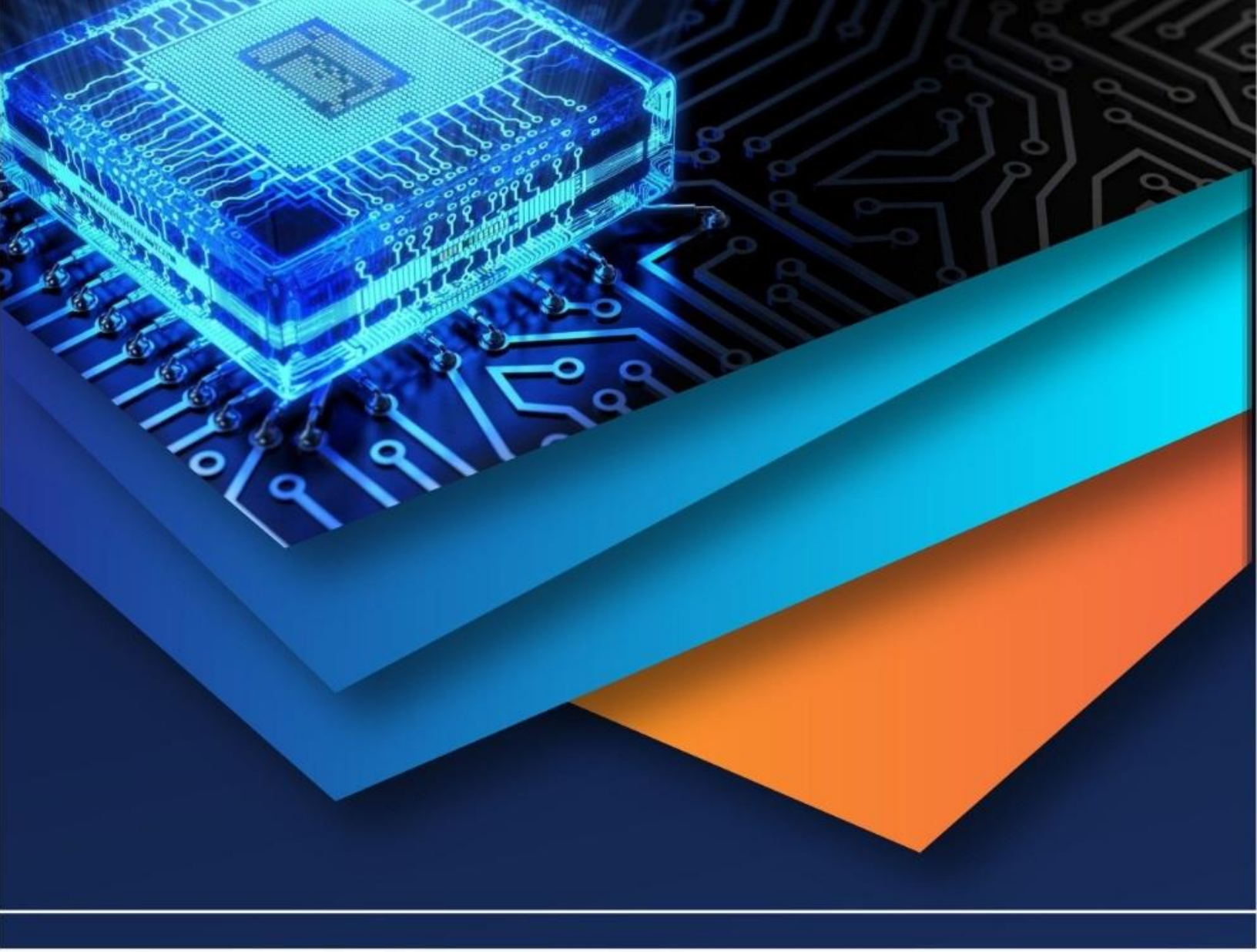
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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

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