



# *PALLET RACKING DESIGN MANUAL*

**Revision: 2**

**SPERRIN METAL STORAGE SOLUTIONS**





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Sperrin products are manufactured under the control of the quality management systems of Sperrin Metal Storage Solutions to BS EN ISO 9001:2008. This Sperrin Design Manual and associated manuals have been designed to reflect standard product configurations. System details and designs may vary according to particular customer requirements.

Sperrin Metal reserve the right to change or modify details and specifications contained within this catalogue without notice.

This Technical Manual is controlled using a revision number which is clearly shown on every page and the current manual is placed in the public folder on the company server. Any other copies of this manual are uncontrolled.



## **ADVANTAGES OF SPERRIN PALLET RACKING**

### **INTRODUCTION**

Sperrin have spent the last three years implementing a successful programme of research and development into a new Pallet Racking System. This programme has involved testing and analysing competitor's systems determining methods of construction and inevitably mechanisms of failure. In total 16 research students under the supervision of Sperrin's Research and Development Department have conducted studies in this area at the Queen's University, Belfast establishing a link with the Mechanical Engineering Dept. on a par with that of Ford, Jaguar or Honda.

All research was originally performed in accordance with SEMA's Code of Practice but this has been taken many steps further to a scientific level with the components being analysed in minute detail in the light of varying material gauge / yield strength and part shapes etc. Sperrin have presented such research to Prof. Jim Rhodes, Strathclyde University, Scotland (one of the main contributors to SEMA and the British Standards Association) who stated that our research levels were well ahead of many competitors and certainly higher than SEMA requirements.

### **SPERRIN UPRIGHT**

The Sperrin upright has been re-designed to give

1. Greater flexibility on account of pitch being reduced from 100mm to 50mm.
2. The upright now being rolled is of a more consistent and definite shape with the fitting of the new roller and punching plant.

### **SPERRIN ANCHOR PLATE**

The Sperrin anchor plate has been re-designed to give

1. increased stiffness at beam joints such that
  - a. All beams now carry greater loads than the original 2-lugged beams
  - b. the racking structures are more stable with ultimately greater factors of safety incorporated in their design compared to competitors systems, e.g. link 51 and Dexion which do not employ the wedge fit system.
2. With the longer anchor plate (now 250mm long) there is now less stress per unit area of the upright caused by anchor pushing against surface than with the original plate (175mm long).

Despite an increase in the length of the anchor plate its material cost has been maintained with a reduction in gauge from 4.75mm to 3.5mm.



## **WELDED FRAMES VERSUS BOLTED FRAMES**

Pallet racking is to all intentions similar in terms of beam, upright, foot-plate and cross-tie design but where a definite demarcation exists is in the form of fabrication and erection. Sperrin's has the capability to supply welded frames or bolted frames. The two systems are compatible and the decision can be customer preference.

NB: Drive – In/ Drive Through System welded frames must be used.

## **CONCLUSION**

Sperrin are in a position of strength in that they are the only manufacturer of storage equipment in Ireland. As a manufacturer they control buying of raw material, manufacturing, shipping and installation such that they can exert full authority and responsibility over the full project. As a result of our close proximity and size we can place you the customer in a position of priority and can supply extras etc. in a short space of time. Also with Northern Ireland's efficient and local workforce (lower paid than any other area of UK) we are able to offer a competitive price backed by a full and instant reply service.

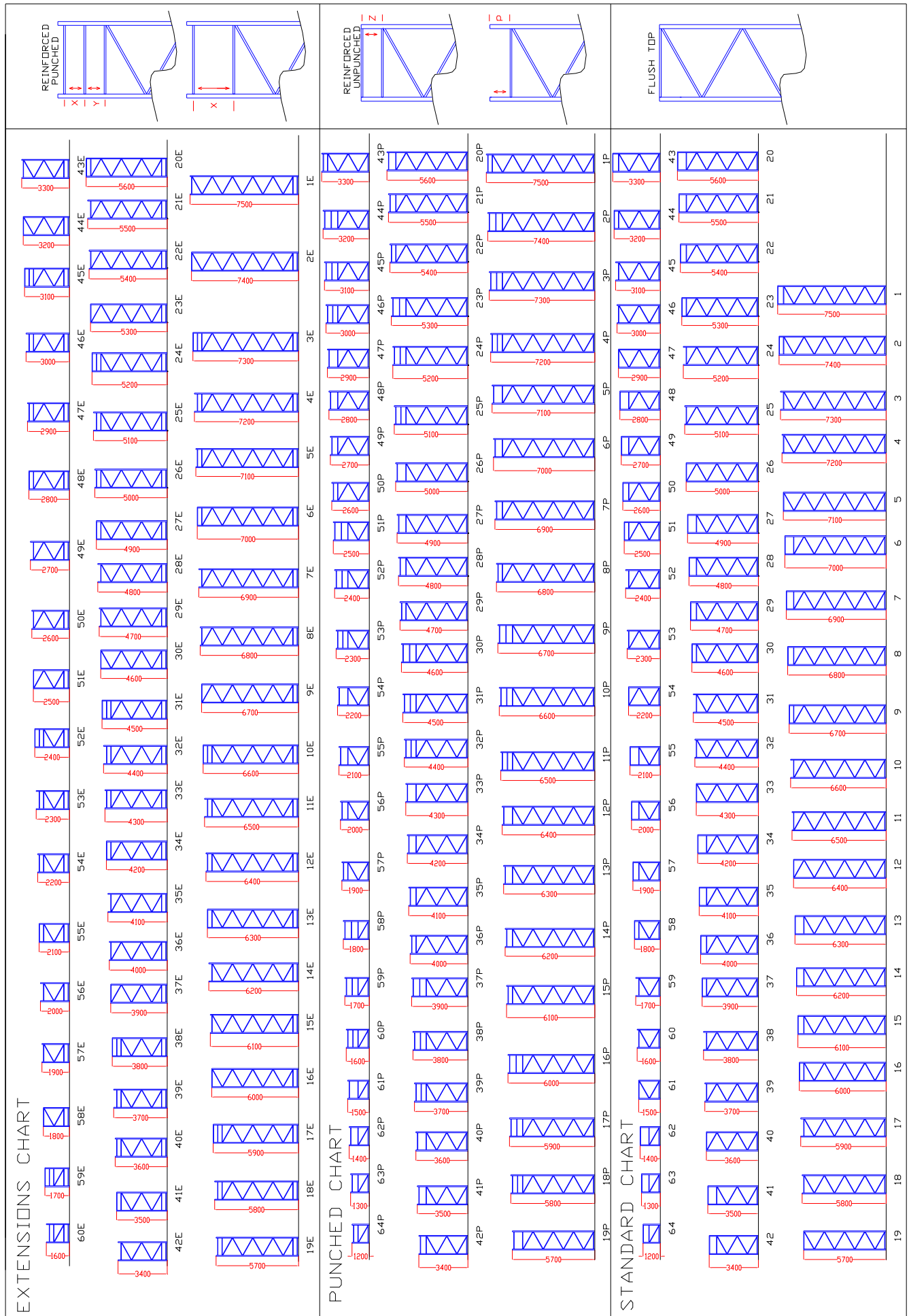
Sperrin have demonstrated their quality in service, supply and manufacture with exports to Europe, Middle East, Far East, America and UK now at 70% of output. Sperrin have received the Queen's Award for Export on three occasions, the DTI business award for British Business and the Anglo-Dutch Award for Enterprise as rewards for its success.



## **POINTS TO CONSIDER WHEN SURVEYING A WORK PLACE FOR STORAGE EQUIPMENT**

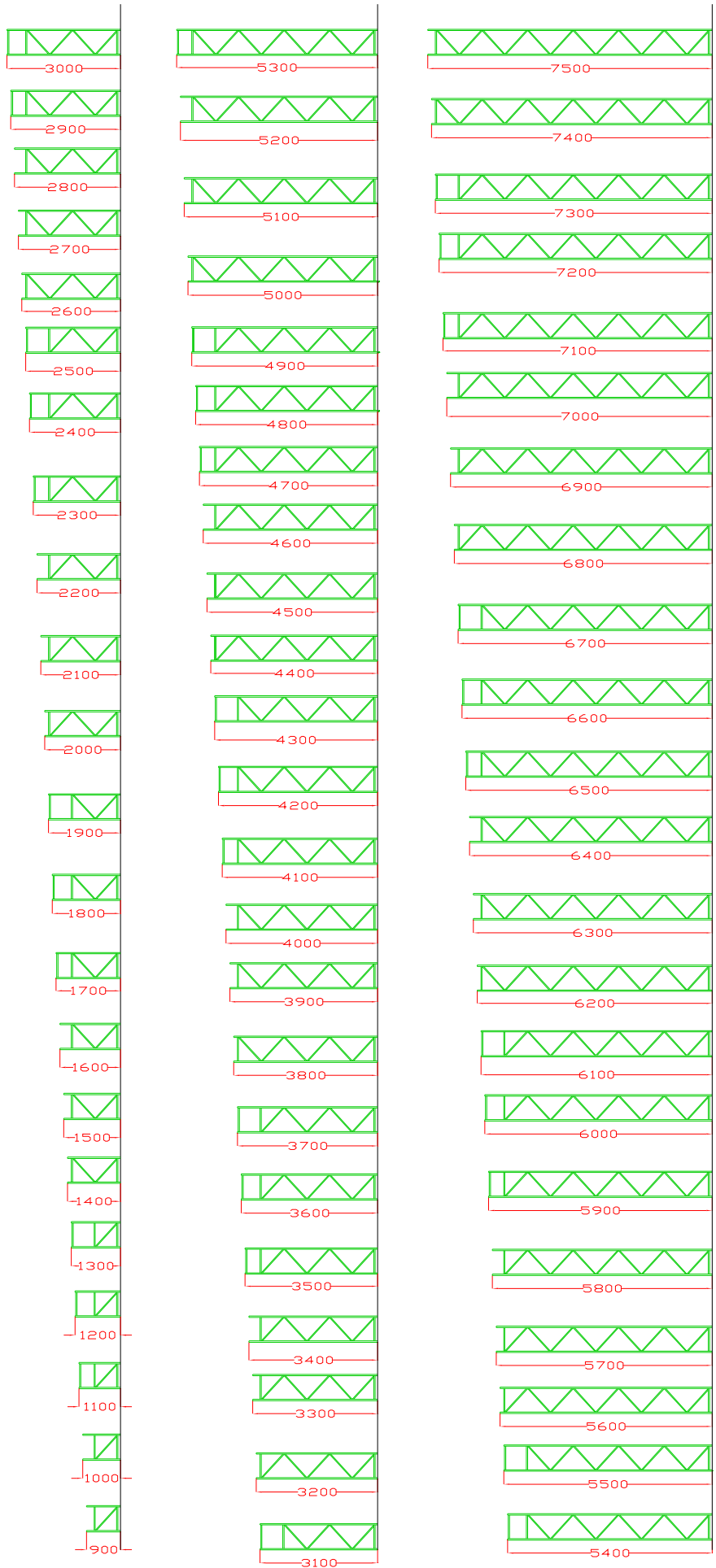
1. Check the state of floor with particular attention to its ability to contain an anchor bolt and that the floor is level (*i.e. floor construction = concrete, bituminous*).
2. Check overall layout of building (*all relevant dimensions*) and positions of permanent fixtures, e.g. pipes, lights, doorways, manhole covers, ceiling steelwork etc.
3. Determine dimensions of product to be stored (*width x depth x height*), are the goods to be palletised (*what type / size of pallet*). Always remember to get the total height of pallet + product to be stored. Find out the orientation of the goods to be stored. Receive a definitive maximum load per pallet from customer.
4. Measure the forklift to be used in association with the Pallet Racking and in particular:
  - a. Is forklift to be Narrow Aisle (*wire guided or guide rail*) or reach truck etc
  - b. Turning circle of forklift to determine aisle width of racking (*reach truck*)
  - c. Maximum reach height of forklift (*highest beam level cannot exceed this*)
  - d. Maximum width of forklift (*narrow and drive-in aisle width determination*)
5. If a completely new system is to be introduced determine from customer the number and mix of pallet sizes.
6. Before leaving site determine colour of racking i.e. standard for uprights = grey or blue beams = orange.
7. It is important to stress that if pallets used by customers are of poor quality then the racking is at risk of the same pallets collapsing.

Determine access points to site, i.e. door opening sizes and actual distance that goods must be transported from lorry off-loading point to erection position. It may also be necessary to agree on a possible clearance schedule where the site is already packed with goods which are to be stored on proposed equipment (*remember that installation can only commence in an area which has been cleared*).

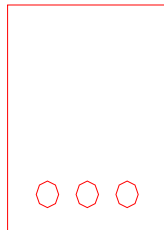


BOLTED END FRAMES

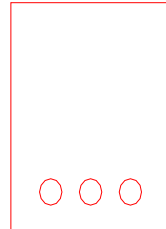
STANDARD CHART



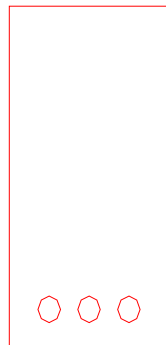
# FOOTPLATES



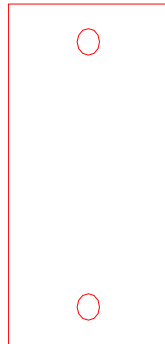
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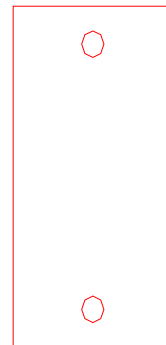
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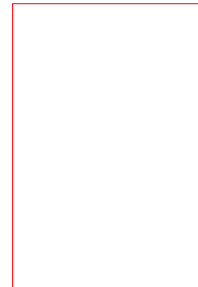
FP:3 <180X100X10>



FP:4 <180X100X5>



FP:5 <180X100X10>

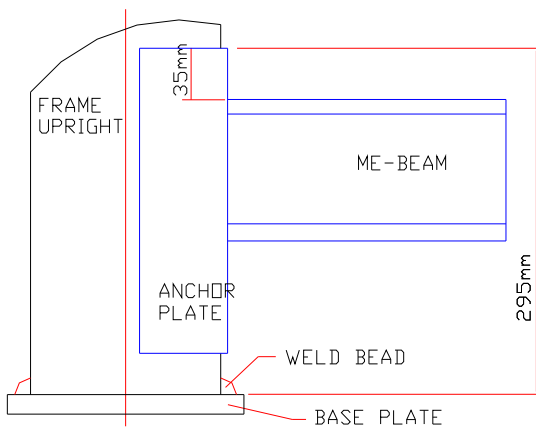
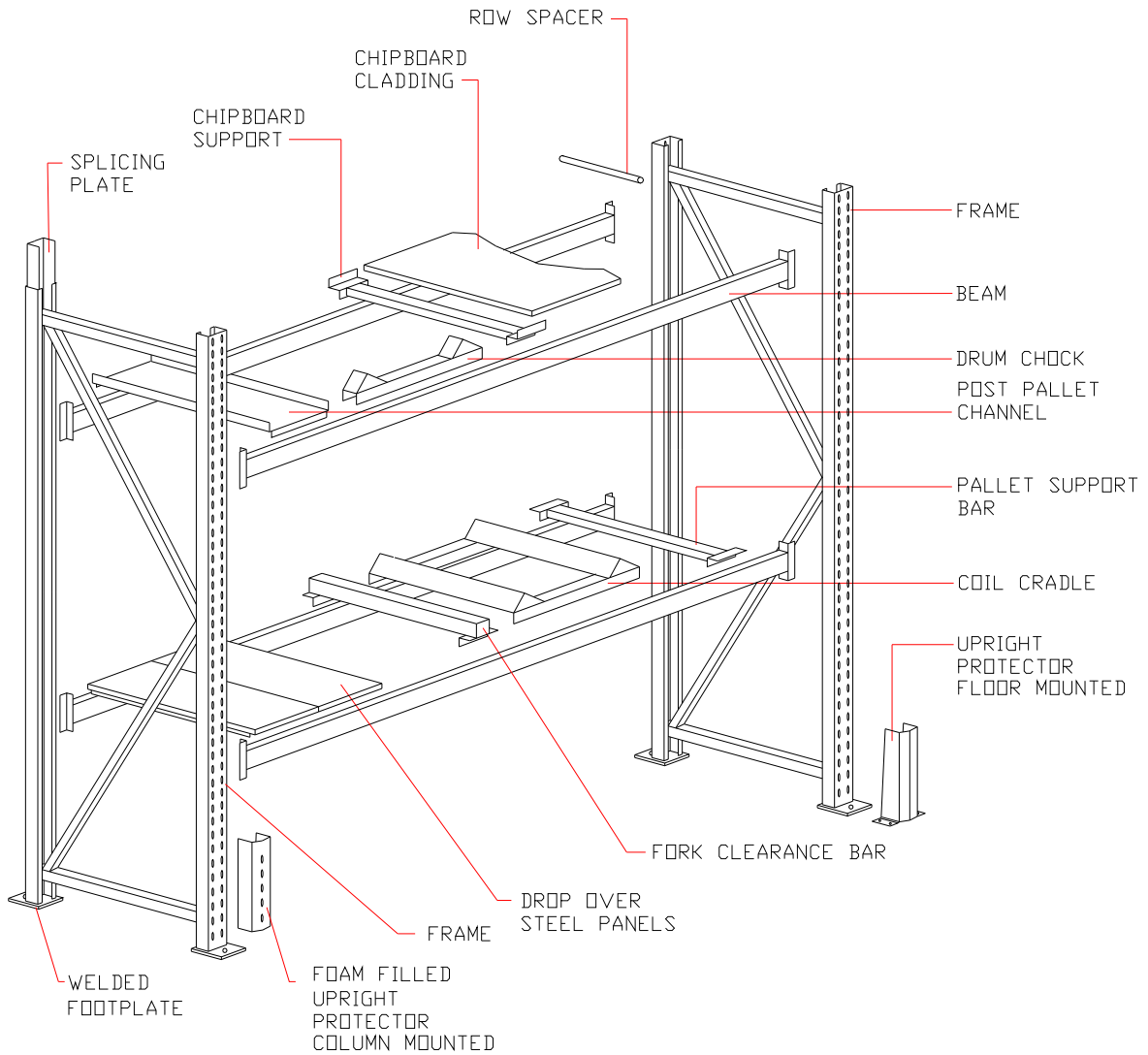


FP:6 <150X120X10>

# STANDARD ADJUSTABLE PALLET RACKING

APR-1

## EXPLODED DRAWING



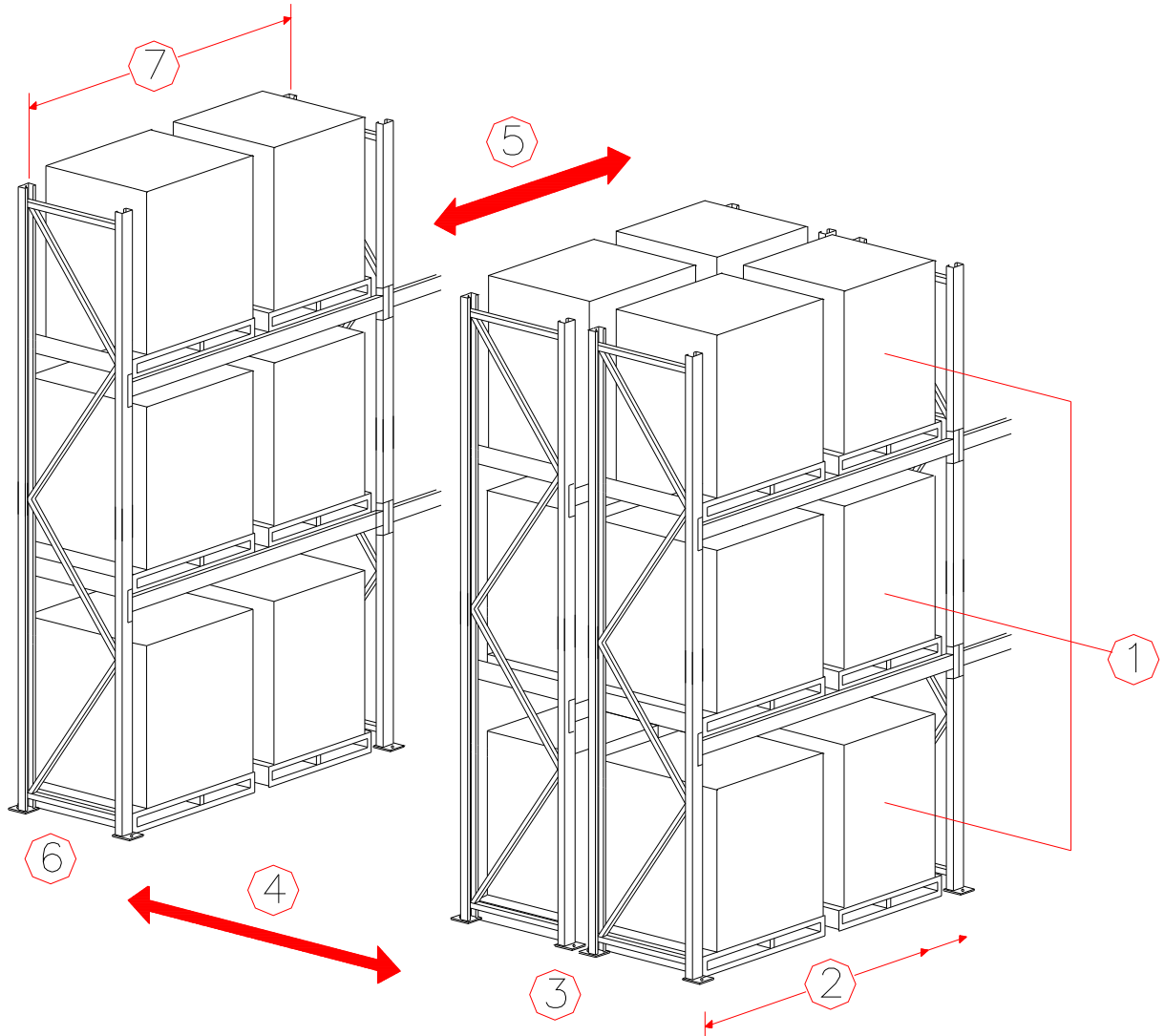
## LOWEST POSITION OF BEAM

To facilitate beam being positioned at bottom, you should add 20mm to profile height ie. A 6000mm E/F should be 6020mm in this instance.

# STANDARD ADJUSTABLE PALLET RACKING

APR-2

## TERMINOLOGY



**1 Levels**

Number of storage levels in the height

**2 Run**

A series of bays connected lengthways

**3 Double Sided Run**

Two runs built back to back

**4 Aisle Width**

Space for movement or transport but not giving direct access to picking or loading faces

**5 Aisle**

Space giving access to picking or loading

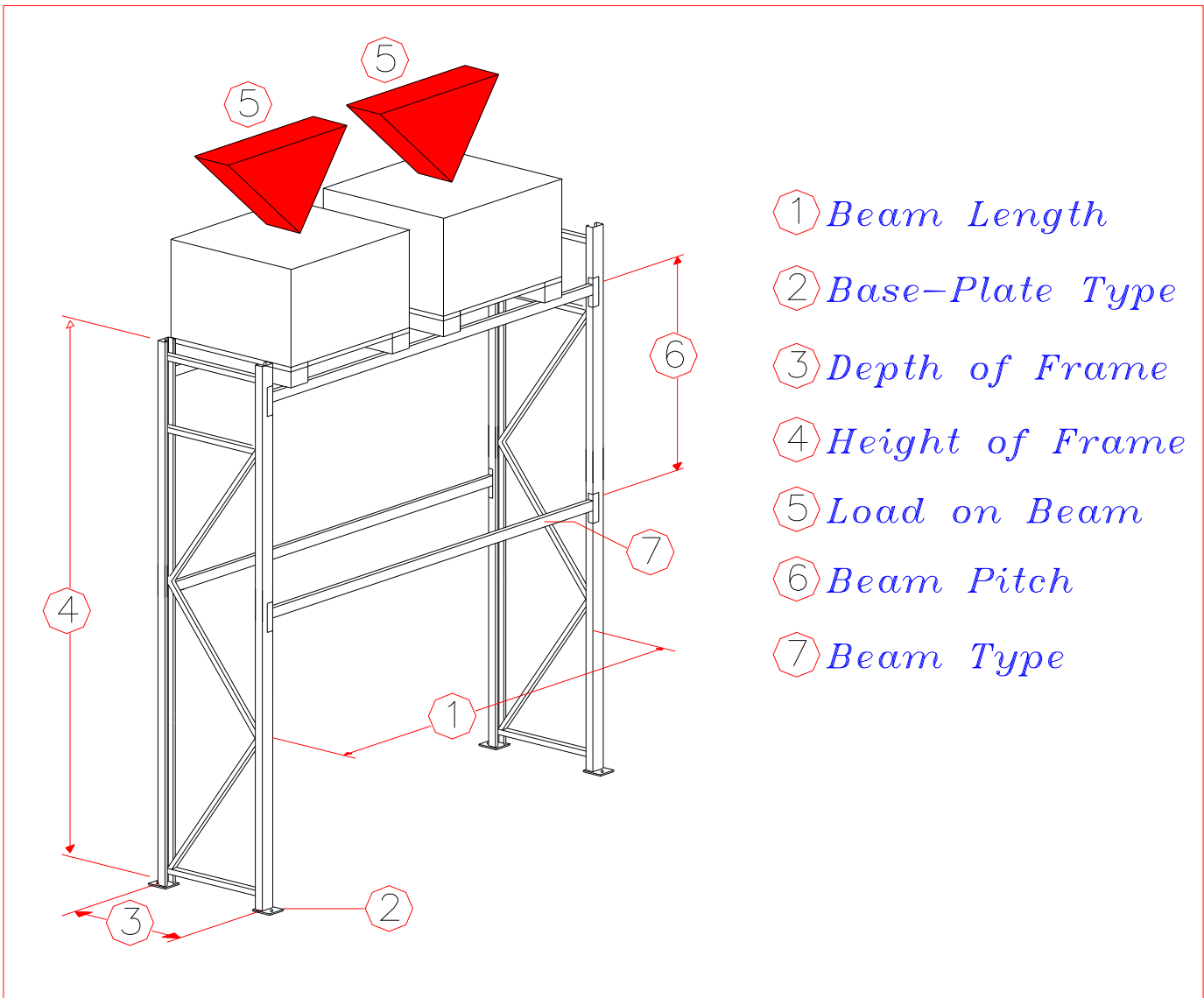
**6 Single Sided Run**

Single depth of rack, usually accessible on one side only.

**7 Bay**

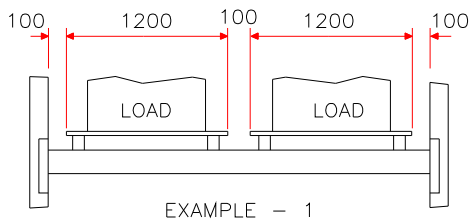
A module between upright frames

# DESIGN ELEMENTS



## ① *Beam Length*

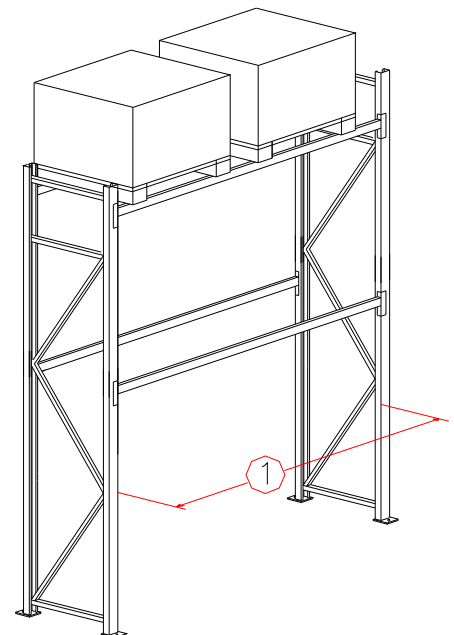
Beam length is calculated from the size of pallets or load (whichever is the greater) with the addition of a minimum of 75mm working clearance.



Worked Examples - 1&2

1 -  $100+1200+100+1200+100 = 2700\text{mm}$

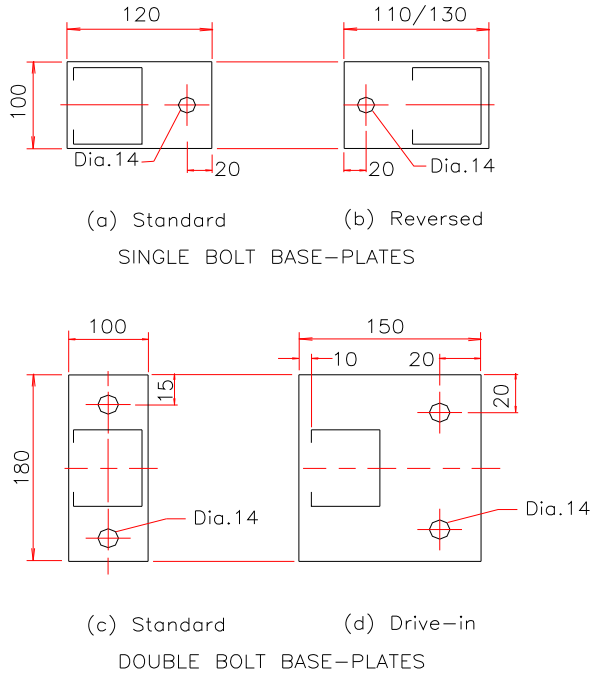
2 -  $75+1000+75+1000+75+1000+75 = 3300\text{mm}$



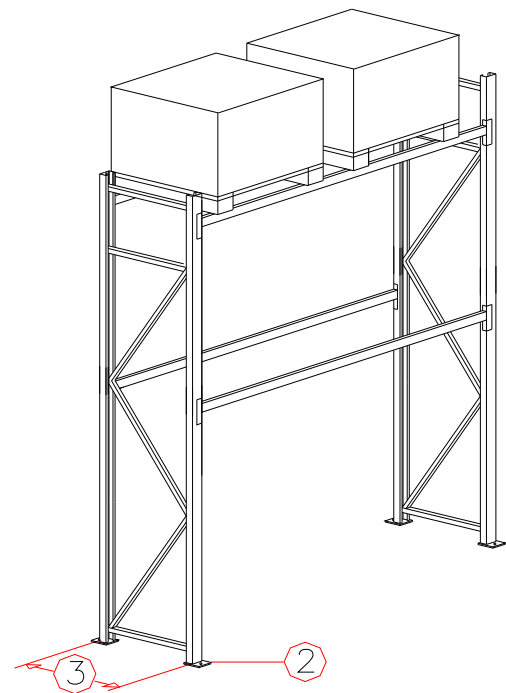
# DESIGN ELEMENTS

APR-4

## 2 Base-Plate Type



NOTE:-  
BASE-PLATES (a) AND (b)- 5mm THICK PLATE  
BASE-PLATE (c) AND (d)-10mm THICK PLATE  
WHEN USING BASE-PLATE (b) LOWEST CROSSTIE  
MUST BE FIXED AT 300mm ABOVE GROUND  
TO ALLOW THE LOCATION OF TRUBOLTS DURING  
INSTALLATION.

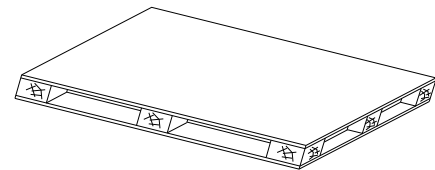
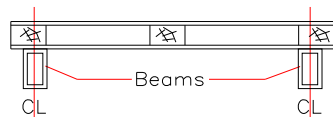


## 3 Depth of Frame

THE FRAME DEPTH IS DICTATED BY THE TYPE AND SIZE OF PALLET BEING USED. THE STANDARD PRACTICE FOR COMMONLY USED PALLETS IS SHOWN BELOW.

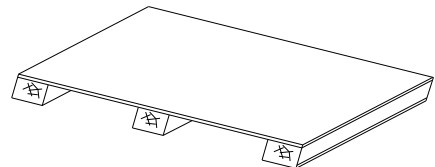
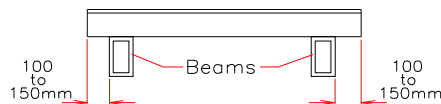
### FOUR-WAY ENTRY

As close as possible to centre line of end pallet blocks.

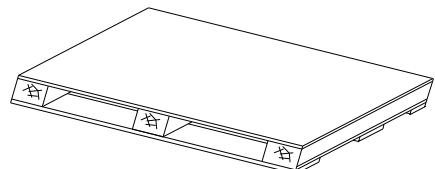
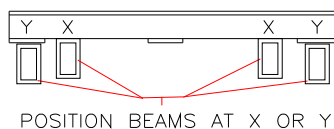


NOTE: Beams must be never be positioned under unsupported perimeter base board.

### TWO-WAY ENTRY (Non Reversible)



### TWO-WAY ENTRY (Standard)



# DESIGN ELEMENTS

APR-5

## 4 Height of Frame

THE HEIGHT OF THE FRAME IS DEPENDENT ON THE BEAM PITCH x NUMBER OF LEVELS.

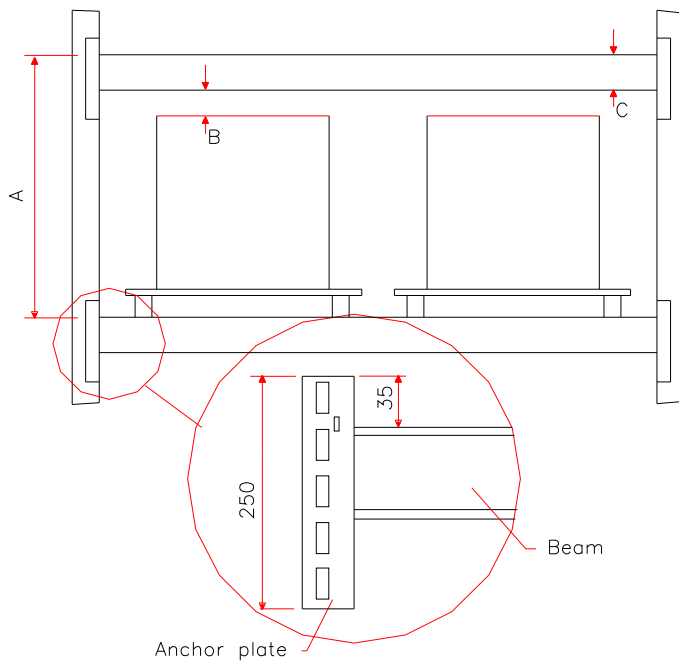
FRAME HEIGHT MUST BE AN INCREMENT OF 50mm.

## 5 Load on Beam

LOAD ON BEAM IS CALCULATED FROM TOTAL WEIGHT OF LOAD AND PALLETS.

BEAM LOADS ARE ALL CONSIDERED AS UNIFORMLY DISTRIBUTED LOADS.

## 6 Beam Pitch

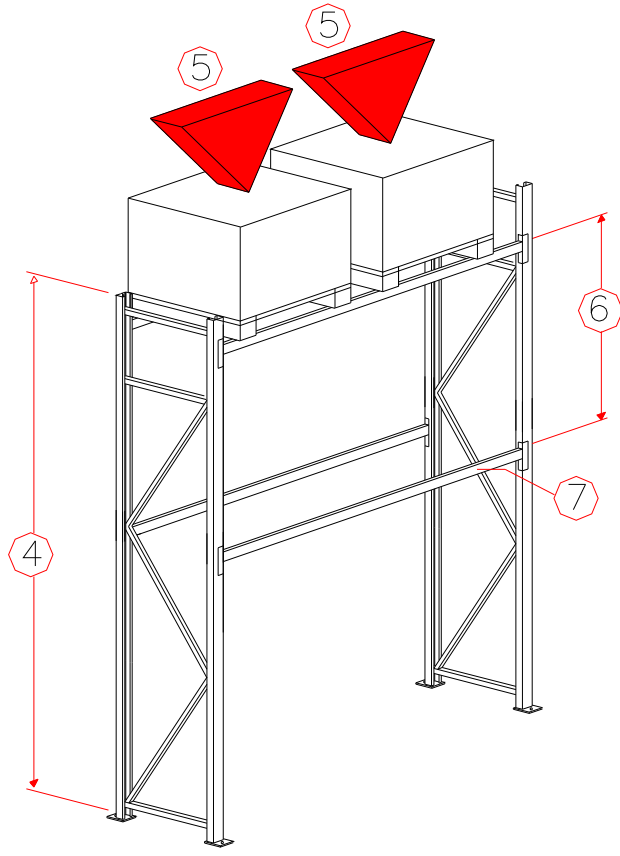


BEAM PITCH IS ALWAYS IN INCREMENTS OF 50mm. BEAMS ARE WELDED 35mm DOWN FROM TOP OF ANCHOR PLATE AS STANDARD.

- A = BEAM PITCH
- B = OPERATING CLEARANCE
- C = BEAM DEPTH - DEPENDS ON BEAM TYPE

BEAM HEIGHT = HEIGHT FROM FLOOR TO TOP OF BEAM.

RECOMMENDED OPERATING CLEARANCE FOR BEAMS	
Beam Height	Minimum Clearance
0m - 3m	75mm
3m - 6m	100mm
6m - 9m	125mm
9m - 12m	150mm



## 7 Beam Type

BEAM TYPE IS DEPENDENT ON LOAD AND SPAN. A BEAM CAN BE SELECTED FROM THE LOAD TABLES.

# STANDARD ADJUSTABLE PALLET RACKING

APR-6

## OVERALL DIMENSIONS

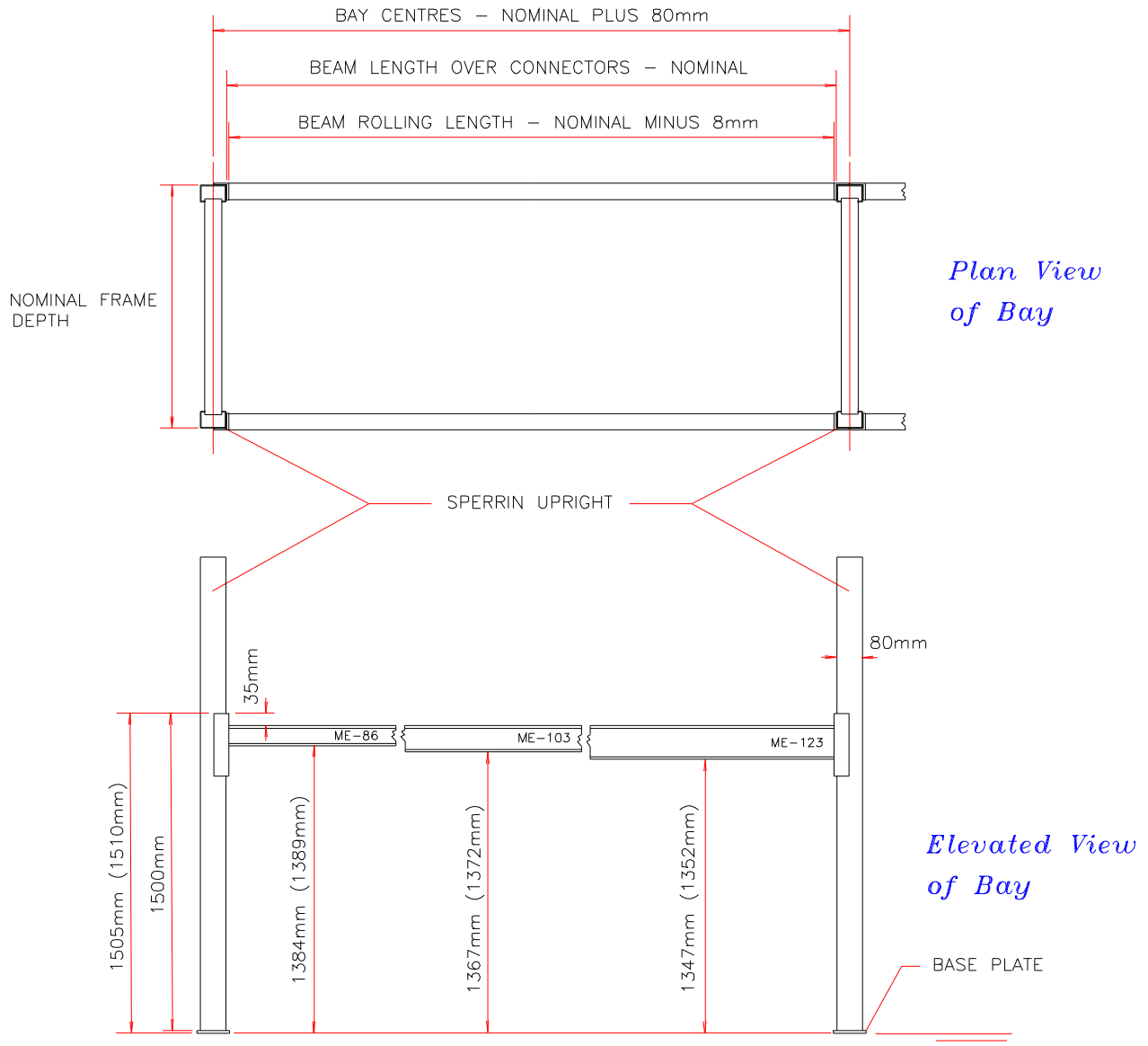


DIAGRAM SHOWING THE RELEVANT CLEARANCES FOR A TYPICAL BAY OF RACKING WHERE THE BEAM IS LOCATED 1500mm ABOVE A 5mm THICK BASE PLATE (Dimensions in brackets indicate relevant clearances for 10mm base plates)

NOTE:-  
 Beam length over connectors Nominal = Dimension shown in Price List & Load Tables.  
 Nominal frame depth = Dimension shown in Price List & Load Tables.  
 It is essential to specify the dimensions shown above correctly in order to prevent design errors.

# FRAME SPECIFICATION

APR-7A

height of end frame (mm)									Total No. of bracing members	
	H	D	H	D						
800	*	*	*		2	H	1	D		
900	*	*		*	2	H	1	D		
1000	*	*			2	H	1	D		
1100	*	*			3	H	1	D		
1200	*	*			3	H	1	D		
1300	*	*			3	H	1	D		
1400	*	*			3	H	1	D		
1500	*	**	*		2	H	2	D		
1600	*	**		*	2	H	2	D		
1700	*	**		*	2	H	2	D		
1800	*	**			3	H	2	D		
1900	*	**			3	H	2	D		
2000	*	**			3	H	2	D		
2100	*	**			3	H	2	D		
2200	*	**	*		2	H	3	D		
2300	*	**	*	*	2	H	3	D		
2400	*	**	*	*	2	H	3	D		
2500	*	**	*	*	3	H	3	D		
2600	*	**	*	*	3	H	3	D		
2700	*	**	*	*	3	H	3	D		
2800	*	**	*	*	3	H	3	D		
2900	*	**	*	*	2	H	4	D		
3000	*	**	*	*	2	H	4	D		
3100	*	**	*	*	2	H	4	D		
3200	*	**	*	*	3	H	4	D		
3300	*	**	*	*	3	H	4	D		
3400	*	**	*	*	3	H	4	D		
3500	*	**	*	*	3	H	4	D		
3600	*	**	*	*	2	H	5	D		
3700	*	**	*	*	2	H	5	D		
3800	*	**	*	*	2	H	5	D		
3900	*	**	*	*	3	H	5	D		
4000	*	**	*	*	3	H	5	D		
4100	*	**	*	*	3	H	5	D		
4200	*	**	*	*	3	H	5	D		
4300	*	**	*	*	2	H	6	D		
4400	*	**	*	*	2	H	6	D		
4500	*	**	*	*	2	H	6	D		
4600	*	**	*	*	3	H	6	D		
4700	*	**	*	*	3	H	6	D		
4800	*	**	*	*	3	H	6	D		
4900	*	**	*	*	3	H	6	D		
5000	*	**	*	*	2	H	7	D		
5100	*	**	*	*	2	H	7	D		
5200	*	**	*	*	2	H	7	D		
5300	*	**	*	*	3	H	7	D		
5400	*	**	*	*	3	H	7	D		
5500	*	**	*	*	3	H	7	D		
5600	*	**	*	*	3	H	7	D		
5700	*	**	*	*	2	H	8	D		
5800	*	**	*	*	2	H	8	D		
5900	*	**	*	*	2	H	8	D		
6000	*	**	*	*	3	H	8	D		
6100	*	**	*	*	3	H	8	D		
6200	*	**	*	*	3	H	8	D		
6300	*	**	*	*	3	H	8	D		
6400	*	**	*	*	2	H	9	D		
6500	*	**	*	*	2	H	9	D		
6600	*	**	*	*	2	H	9	D		
6700	*	**	*	*	3	H	9	D		
6800	*	**	*	*	3	H	9	D		
6900	*	**	*	*	3	H	9	D		
7000	*	**	*	*	3	H	9	D		
7100	*	**	*	*	2	H	10	D		
7200	*	**	*	*	2	H	10	D		
7300	*	**	*	*	2	H	10	D		
7400	*	**	*	*	3	H	10	D		
7500	*	**	*	*	3	H	10	D		

Frame depth	500	600	700	800	900	1000	1100	1200	1300	1400	1500
horizontal	420	520	620	720	820	920	1020	1120	1220	1320	1420
diagonal	780	850	900	975	1050	1125	1225	1300	1400	1475	1575

FOR FRAMES GREATER THAN 7500mm SPLICING IS REQUIRED.  
 FOR FRAMES GREATER THAN 6000mm IN HEIGHT CONSULT DESIGN OFFICE.

# BOLTED FRAME SPECIFICATION

APR-7B

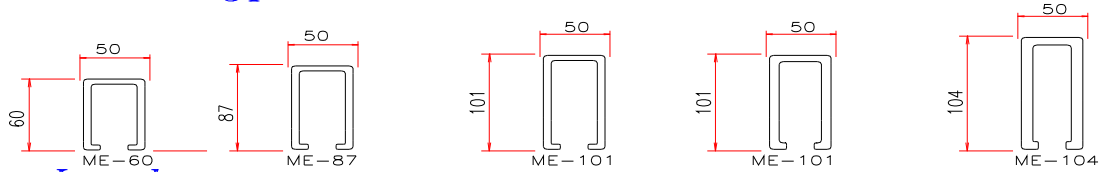
height of end frame (mm)								Total No. of bracing members H=horiz. d=diag.	
	150	600	50	150	250	350	450		550
800	*	*	*						2 H 1 D
900	*	*		*					2 H 1 D
1000	*	*			*				2 H 1 D
1100	*	*				*			3 H 1 D
1200	*	*					*		3 H 1 D
1300	*	*						*	3 H 1 D
1400	*	**	*						2 H 2 D
1500	*	**		*					2 H 2 D
1600	*	**			*				2 H 2 D
1700	*	**				*			3 H 2 D
1800	*	**					*		3 H 2 D
1900	*	**						*	3 H 2 D
2000	*	**	*						2 H 3 D
2100	*	**		*					2 H 3 D
2200	*	**			*				2 H 3 D
2300	*	**				*			3 H 3 D
2400	*	**					*		3 H 3 D
2500	*	**						*	3 H 3 D
2600	*	**	*						2 H 4 D
2700	*	**		*					2 H 4 D
2800	*	**			*				2 H 4 D
2900	*	**				*			3 H 4 D
3000	*	**					*		3 H 4 D
3100	*	**						*	3 H 4 D
3200	*	**	*						2 H 5 D
3300	*	**		*					2 H 5 D
3400	*	**			*				2 H 5 D
3500	*	**				*			3 H 5 D
3600	*	**					*		3 H 5 D
3700	*	**						*	3 H 5 D
3800	*	**	*						2 H 6 D
3900	*	**		*					2 H 6 D
4000	*	**			*				2 H 6 D
4100	*	**				*			3 H 6 D
4200	*	**					*		3 H 6 D
4300	*	**						*	3 H 6 D
4400	*	**	*						2 H 7 D
4500	*	**		*					2 H 7 D
4600	*	**			*				2 H 7 D
4700	*	**				*			3 H 7 D
4800	*	**					*		3 H 7 D
4900	*	**						*	3 H 7 D
5000	*	**	*						2 H 8 D
5100	*	**		*					2 H 8 D
5200	*	**			*				2 H 8 D
5300	*	**				*			3 H 8 D
5400	*	**					*		3 H 8 D
5500	*	**						*	3 H 8 D
5600	*	**	*						2 H 9 D
5700	*	**		*					2 H 9 D
5800	*	**			*				2 H 9 D
5900	*	**				*			3 H 9 D
6000	*	**					*		3 H 9 D
6100	*	**						*	3 H 9 D
6200	*	**	*						2 H 10 D
6300	*	**		*					2 H 10 D
6400	*	**			*				2 H 10 D
6500	*	**				*			3 H 10 D
6600	*	**					*		3 H 10 D
6700	*	**						*	3 H 10 D
6800	*	**	*						2 H 11 D
6900	*	**		*					2 H 11 D
7000	*	**			*				2 H 11 D
7100	*	**				*			3 H 11 D
7200	*	**					*		3 H 11 D
7300	*	**						*	3 H 11 D
7400	*	**	*						2 H 12 D
7500	*	**	*	*					2 H 12 D

End Frame Depth	Crosstie Sizes			
	Horizontal		Diagonals	
	Hole Centres	Overall Length	Hole Centres	Overall Length
700	588	638	841	891
800	688	738	914	964
900	788	838	992	1040
1000	888	938	1073	1123
1100	988	1038	1157	1206
1200	1088	1138	1244	1294
1300	1188	1238	1332	1382
1400	1288	1338	1421	1464
1500	1388	1438	1512	1555
1600	1488	1538	1604	1654

FDR FRAMES GREATER THAN 7500mm SPLICING IS REQUIRED.  
FDR FRAMES GREATER THAN 6000mm IN HEIGHT CONSULT DESIGN OFFICE.

# BEAM SECTIONS

## Open Beam Type



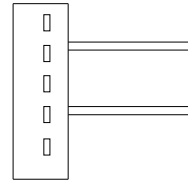
### Beam Loads

NOTE :-

ALL LOADS SPECIFIED PER PAIR OF BEAMS.  
 ALL LOADS SPECIFIED ARE UNIFORMLY DISTRIBUTED ALONG TOTAL LENGTH.  
 ALL LOADS ARE BASED ON BEAMS WITH ANCHOR PLATE WELDED IN THE STANDARD LOCATION (35mm DOWN FROM TOP OF BEAM).  
 TESTS PERFORMED AT QUEEN'S UNIVERSITY, BELFAST IN ACCORDANCE WITH TEST PROCEDURES AS SPECIFIED IN THE STORAGE EQUIPMENT MANUFACTURER'S ASSOCIATION (SEMA) CODE OF PRACTICE.  
 LOAD CAPACITY DETERMINED BY MOST CRITICAL VALUE OF 1/200 DEFLECTION LIMIT OR SAFETY FACTOR =2.

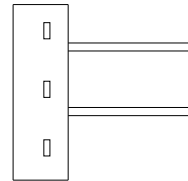
SPAN OF BEAM (mm)	ME-60 BEAM (kg)	ME-87 BEAM (kg)	ME-101 BEAM (kg)	ME-101 BEAM (kg)	ME-104 BEAM (kg)
1200	1956	3149	3970	4958	5610
1275	1866	2992	3770	4703	5318
1350	1705	2852	3592	4476	5057
1425	1556	2726	3432	4272	4823
1500	1428	2612	3287	4087	4611
1575	1316	2508	3156	3919	4419
1650	1218	2414	3036	3766	4244
1725	1131	2327	2926	3626	4084
1800	1063	2247	2824	3498	3936
1875	984	2095	2731	3379	3800
1950	923	1956	2644	3269	3674
2025	867	1831	2564	3167	3557
2100	816	1719	2474	3025	3448
2175	771	1617	2326	2842	3259
2250	729	1525	2193	2676	3067
2325	691	1441	2071	2524	2891
2400	656	1364	1960	2386	2731
2475	624	1293	1858	2260	2585
2550	594	1229	1764	2144	2451
2625	566	1169	1678	2037	2327
2700	541	1114	1598	1939	2213
2775	517	1063	1525	1848	2108
2850	495	1015	1456	1763	2010
2925	475	971	1393	1685	1920
3000	456	930	1333	1612	1836
3075	438	882	1278	1544	1757
3150	421	856	1227	1481	1684
3225	406	823	1178	1421	1616
3300	391	792	1133	1366	1552
3375	377	762	1091	1313	1492
3450	364	734	1051	1264	1435
3525	351	708	1013	1218	1382
3600	340	684	978	1175	1332
3675		660	944	1134	1285
3750		638	812	1095	1240
3825		617	882	1058	1198
3900		598	854	1024	1158
3975		579	827	991	1121
4050		561	801	959	1086
4125		544	777	930	1051
4200		528	754	902	1019
4275			732	875	988
4350			711	849	959
4425			691	825	931
4500			672	802	904
4575			654	779	879
4650			636	758	855
4725			619	738	832
4800			603	719	809
4875			588	700	788

### Existing 5-Lugged System



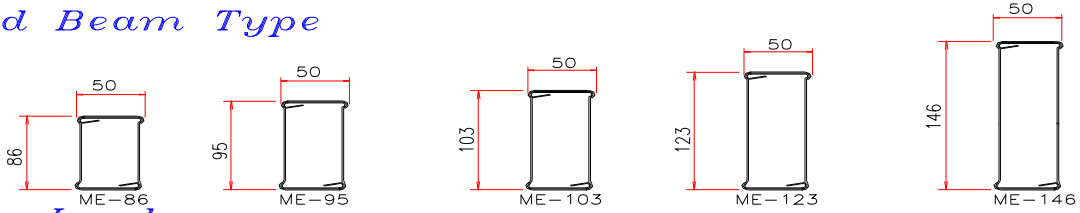
### OLD 3-Lugged System

This system is only available when replacing beams in mark 1 system. Loadings for information purposes only.



# BEAM SECTIONS

## Boxed Beam Type



## Beam Loads

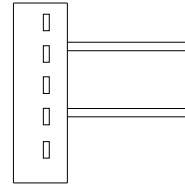
NOTE :-

ALL LOADS SPECIFIED PER PAIR OF BEAMS.  
 ALL LOADS SPECIFIED ARE UNIFORMLY DISTRIBUTED ALONG TOTAL LENGTH.  
 ALL LOADS ARE BASED ON BEAMS WITH ANCHOR PLATE WELDED IN THE STANDARD LOCATION (35mm DOWN FROM TOP OF BEAM).

TESTS PERFORMED AT QUEEN'S UNIVERSITY, BELFAST IN ACCORDANCE WITH TEST PROCEDURES AS SPECIFIED IN THE STORAGE EQUIPMENT MANUFACTURER'S ASSOCIATION (SEMA) CODE OF PRACTICE.  
 LOAD CAPACITY DETERMINED BY MOST CRITICAL VALUE OF 1/200 DEFLECTION LIMIT OR SAFETY FACTOR =2.

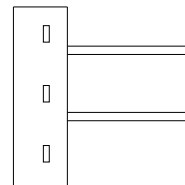
SPAN OF BEAM (mm)	ME-86 BEAM (kg)	ME-95 BEAM (kg)	ME-103 BEAM (kg)	ME-123 BEAM (kg)	ME-146 BEAM (kg)
1200	5443	7258	7258	7258	7258
1275	5443	7258	7258	7258	7258
1350	5443	7033	7258	7258	7258
1425	5443	6704	7258	7258	7258
1500	5443	6406	7012	7258	7258
1575	5205	6136	6711	7258	7258
1650	4811	5890	6438	7258	7258
1725	4463	5664	6187	7258	7258
1800	4155	5366	5957	7258	7258
1875	3880	4981	5745	7113	7258
1950	3635	4637	5455	6864	7258
2025	3414	4329	5088	6634	7258
2100	3214	4051	4759	6335	7258
2175	3028	3801	4462	5973	7233
2250	2847	3574	4192	5645	6830
2325	2683	3368	3948	5345	6462
2400	2534	3180	3725	5071	6126
2475	2397	3008	3521	4820	5818
2550	2272	2850	3334	4589	5535
2625	2156	2705	3162	4376	5274
2700	2050	2572	3004	4179	5033
2775	1951	2448	2858	3996	4810
2850	1860	2334	2722	3827	4603
2925	1776	2228	2597	3669	4410
3000	1687	2129	2480	3522	4231
3075	1624	2037	2372	3385	4063
3150	1558	1951	2271	3258	3907
3225	1492	1871	2176	3138	3760
3300	1433	1796	2088	3020	3622
3375	1377	1726	2005	2898	3493
3450	1324	1660	1927	2783	3371
3525	1275	1598	1854	2675	3257
3600	1228	1540	1785	2574	3149
3675	1184	1484	1720	2479	3047
3750	1143	1433	1659	2389	2950
3825	1104	1383	1602	2304	2859
3900	1067	1337	1547	2224	2772
3975	1032	1293	1495	2148	2690
4050	998	1251	1446	2076	2612
4125	967	1212	1400	2008	2537
4200	937	1174	1356	1944	2467
4275	908	1138	1314	1882	2399
4350	881	1104	1274	1824	2335
4425	855	1072	1236	1768	2273
4500	831	1041	1199	1715	2215
4575	807	1011	1165	1665	2159
4650	785	983	1132	1617	2105
4725	763	956	1100	1571	2054
4800	743	930	1070	1527	2005
4875	723	906	1041	1485	1958

## Existing 5-Lugged System



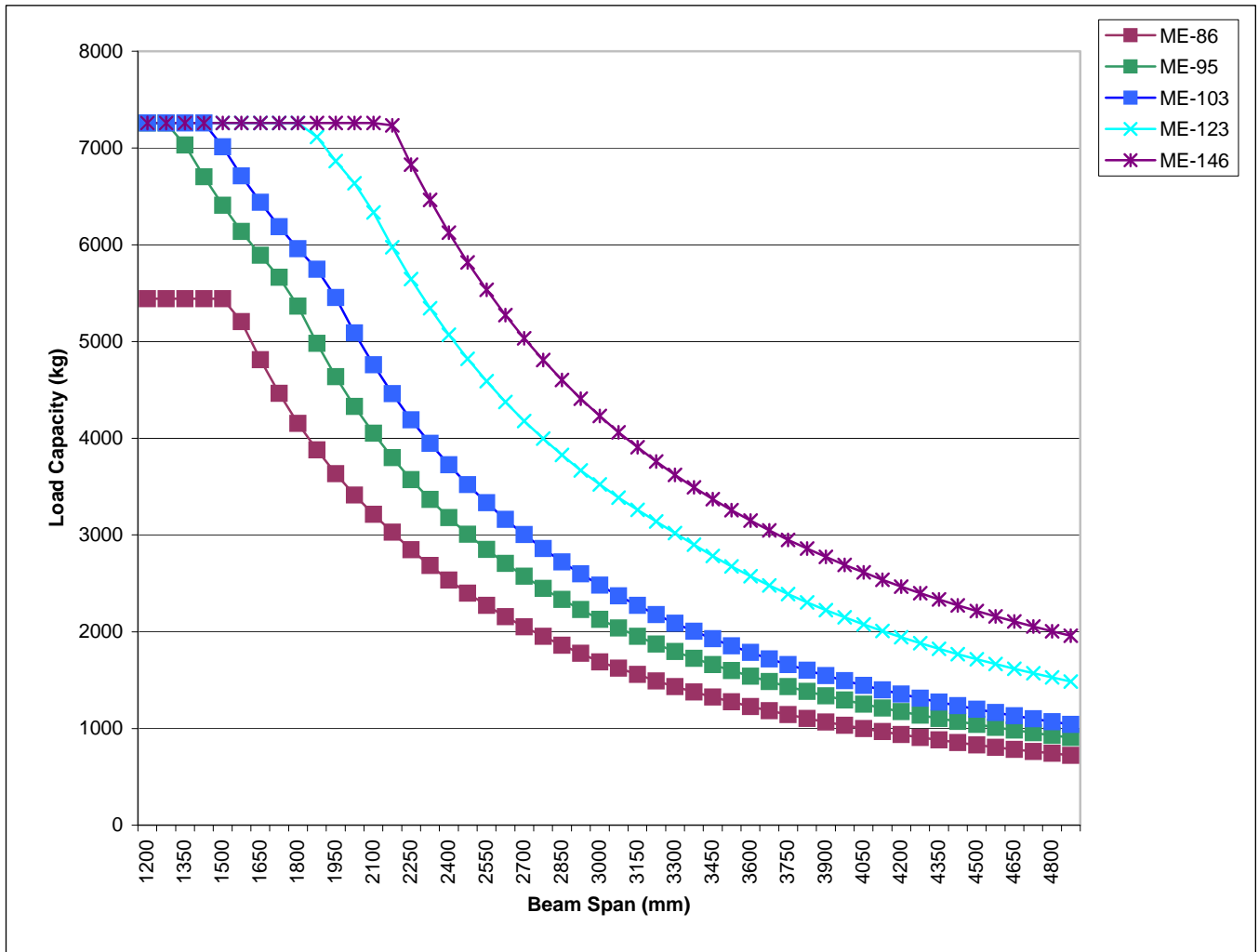
## OLD 3-Lugged System

This system is only available when replacing beams in mark 1 system. Loadings for information purposes only.





DEPARTMENT OF RESEARCH AND DEVELOPMENT  
 BEAM LOAD CAPACITY TESTS - NEW 5-LUGGED BEAM SYSTEM



The load capacities opposite have been interpolated from Beam Load Capacity tests performed on pairs of standard Sperrin boxed beams with 5-lugged end plates.

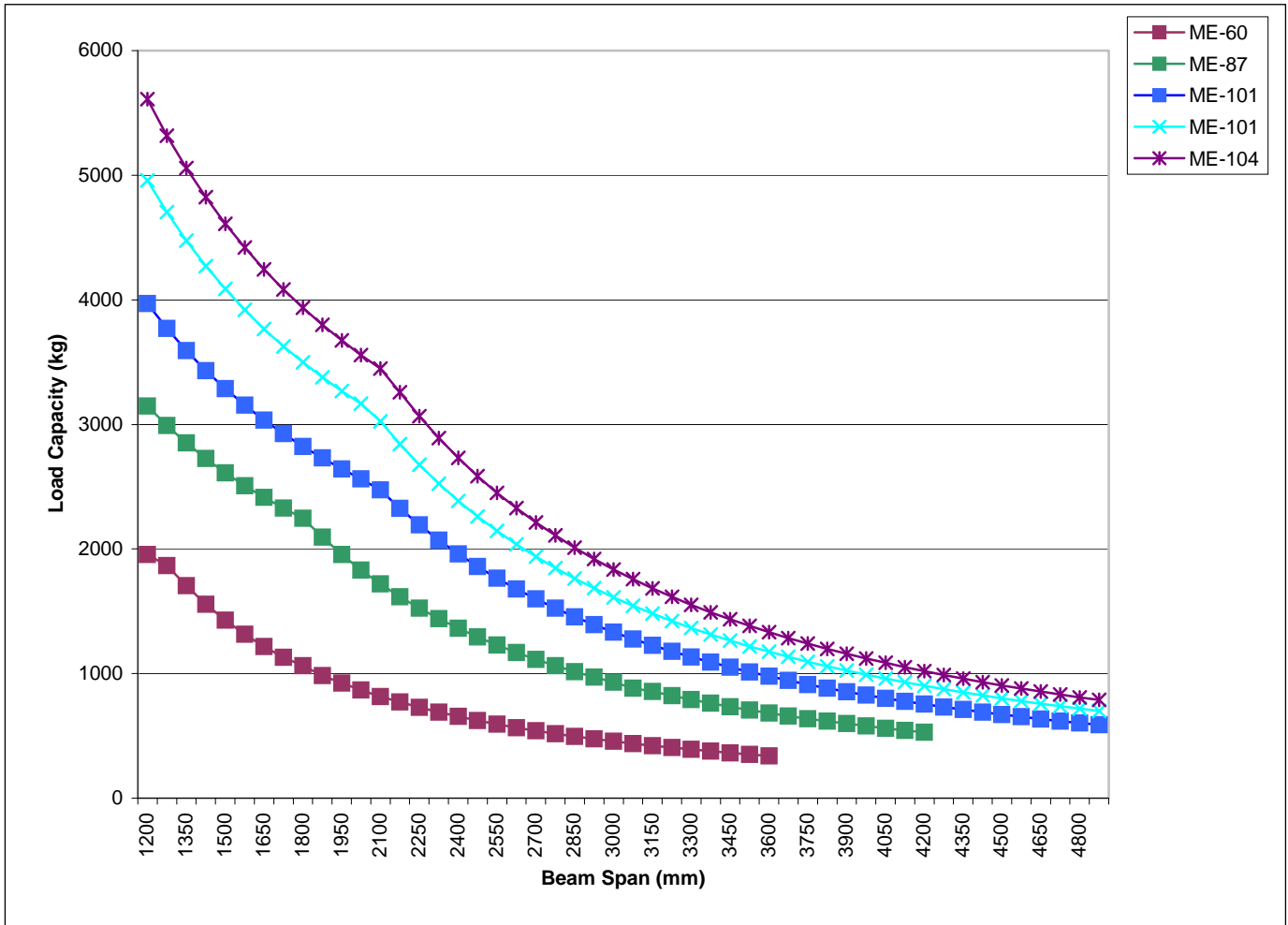
The tests were conducted at the Queen’s University, Belfast in accordance with test procedures as specified in the Storage Manufacturer’s Code of Practice.

Load capacity determined by most critical value of 1/200 deflection limit of safety factor =2.

Note that all load capacities are Uniformly Distributed Loads (UDL).



DEPARTMENT OF RESEARCH AND DEVELOPMENT  
 BEAM LOAD CAPACITY TESTS - NEW 5-LUGGED BEAM SYSTEM



The load capacities opposite have been interpolated from Beam Load Capacity tests performed on pairs of standard Sperrin open beams with 5-lugged end plates.

The tests were conducted at the Queen’s University, Belfast in accordance with test procedures as specified in the Storage Manufacturer’s Code of Practice.

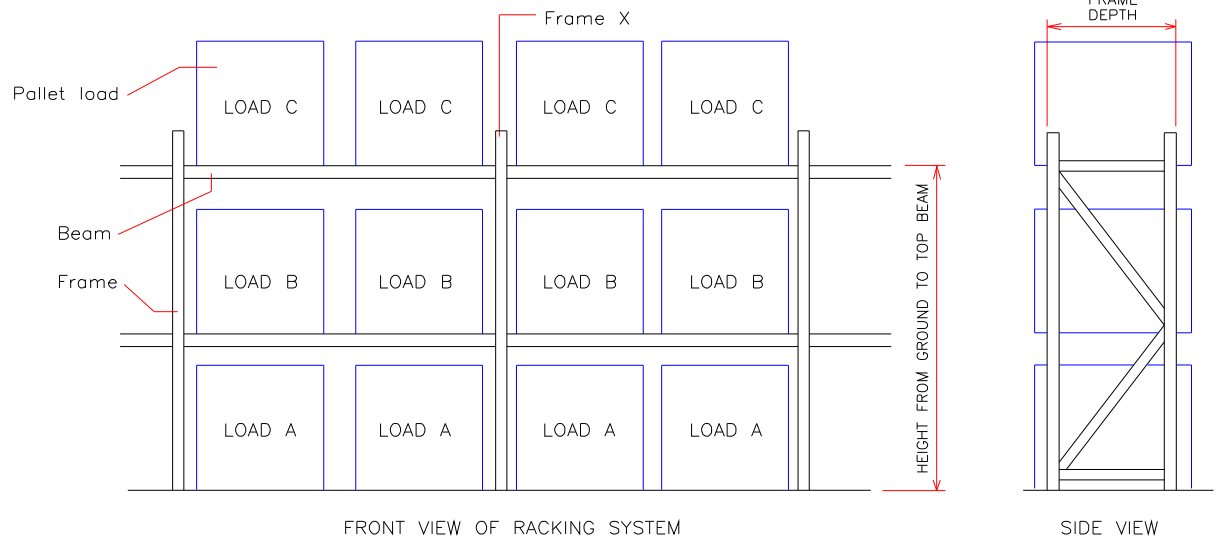
Load capacity determined by most critical value of 1/200 deflection limit of safety factor =2.

Note that all load capacities are Uniformly Distributed Loads (UDL).

# FRAME LOAD DESIGN

APR-9

## Frame Stability



When designing a Standard Adjustable Pallet Racking system, the stability of the structure must first be verified. The stability of the racking structure is dependent upon the frame depth and height and whether the system runs are single sided or double sided. Double sided runs are generally stable provided the Row Spacer Schedule shown below is followed. Single Sided Runs with a Stability Factor (see below) > 10, must be fixed to Double Sided Runs by means of Aisle Struts or must be fixed to the surrounding building structure. Where the latter practice is followed an analysis of the resultant forces, etc. must be performed and the Building Designers must be briefed accordingly.

$$\text{STABILITY FACTOR} = \frac{\text{DISTANCE FROM GROUND TO TOP BEAM LEVEL}}{\text{FRAME DEPTH}}$$

For Double Sided Runs, Row Spacers must be placed in the vertical height every 2500mm. The following is a schedule showing the number of Row Spacers required for different frame depths of which the Stability Factor = 10.

FRAME DEPTH (mm)	750	800	900	1000	1100	1200	1250
HEIGHT (mm) STABILITY FACTOR = 10	7500	8000	9000	10000	11000	12000	12500
No. OF ROW SPACERS	3	3	3	4	4	4	5

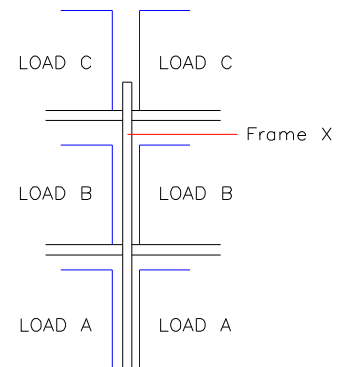
## Frame Loading

When evaluating loads on frames calculate as follows:

The loads that are relevant to the frames are those which are acting directly on it, i.e. loads placed on the floor will not affect frame design.

In the case of the example opposite, load type A is located on the floor and is therefore irrelevant to the frame design. The frame must be designed to carry load types B and C. Thus the total load on the frame is

$$\text{LOAD ON FRAME X} = (2 \times B) + (2 \times C) = 2B + 2C$$

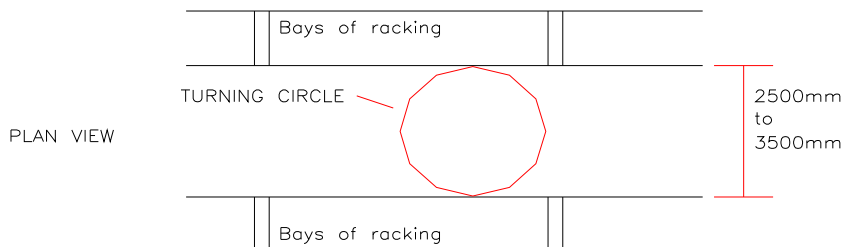




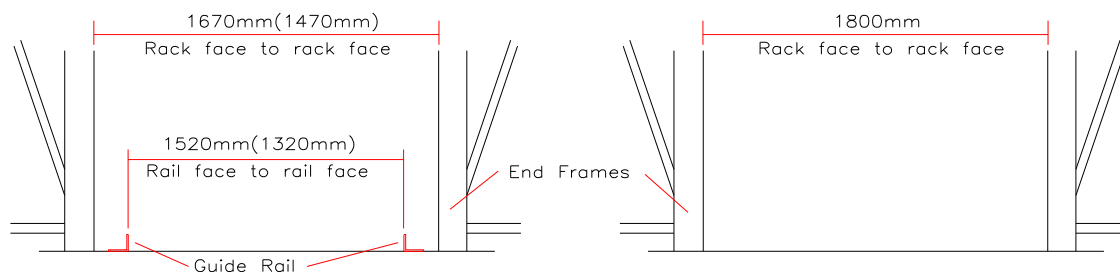
# AISLE WIDTHS & GUIDE RAIL DETAILS APR-11

## Standard Racking

For Standard Adjustable Racking a typical Aisle width can vary from 2500mm to 3500mm depending on the turning circle of the existing or proposed forklift truck.



## Narrow Aisle Racking



( ) This indicates advised minimum dimension.

(a) Guide Rail System

(b) Wire Guided System

(a) Guide Rail System

For Guide Rail System the minimum rail to rail distance to be specified = 1320mm

In standard cases a distance of 1520mm (Rail to Rail) is specified for Guide Rail Systems.

(b) Wire Guided Systems

For Wire Guided Systems the standard Rack Face to Rack Face dimension to be specified = 1800mm.

THE ABOVE DIMENSIONS ARE FOR GUIDANCE PURPOSES ONLY AND WHERE DIMENSIONS / SYSTEMS VARY SO THE SPECIFICATION AND COST OF FORKLIFT EQUIPMENT WILL VARY ALSO. THE DIMENSIONS OF THE ABOVE MUST ALWAYS BE CHECKED AGAINST THE OPERATING DIMENSIONS OF THE FORKLIFT EQUIPMENT. FORKLIFTS FROM DIFFERENT MANUFACTURES HAVE DIFFERENT PROPERTIES SO ALWAYS CHECK THIS.

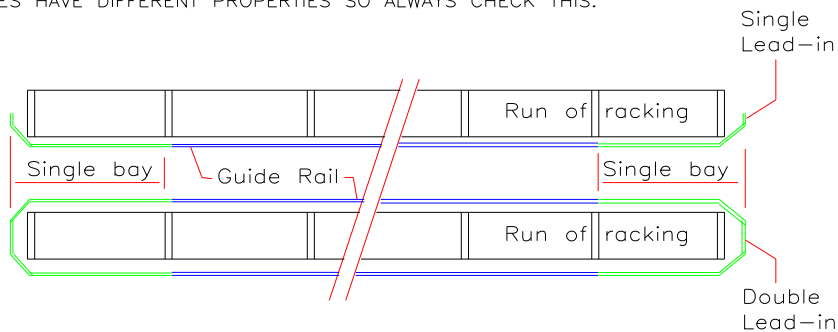
## Guide Rail Details

(a) 100mm x 75mm x 10mm Angle  
Punched every 300mm. —

This rail used for Single and Double Lead-ins and the length of 1st bay of rail at the entrance to each end of the run of Narrow Aisle Racking.

(b) 50mm x 50mm x 8mm Angle  
Punched every 600mm. —

This rail used in all other areas.



Plan View of Narrow Aisle Guide Rail System  
T15100 Trubolts used for fixing purposes.

NOTE DESIGNS MAY VARY ACCORDING TO PARTICULAR SYSTEMS



## **INSTALLATION OF STANDARD PALLET RACKING**

***The following is a guide to the installation of standard pallet racking.***

1. A site survey is required before the installation proceeds. This is to ensure that the dimensions that you are working to are correct. It is also advisable to measure out aisle widths and show the customer the aisle widths he is going to get. Alterations may have to be made at this stage to accommodate forklift turning circles, access, etc., if changes are to be made it is easier to do it now than when the racking is installed.
2. Once dimensions have been checked, lines are drawn on the floor using a chalk line. All dimensions given are from the front face of the frame, therefore the chalk line as is shown in the diagram is for the front face. Two chalk lines are drawn (at 90 degrees to each other, as in the diagram) and the second line is where the feet locate.
3. The first "bay" of racking can then be erected. Locate feet in the approximate position and stand frame vertical. Locate two beams in this frame while holding frame in the vertical position (it does not matter if the beams are not at the correct level now).
4. Locate feet of another frame approximately under the ends of the beams and stand vertical. Locate the beams ensuring they are horizontal in the newly erected frame. The "starter bay" is now complete.
5. This can be positioned easily over the chalk lines and when this is done drill down the end frame.
6. Check beam level and change beams if necessary. Locate two beams onto the newly erected frame. Erect another frame into position as before and locate the beams.
7. Repeat Step 6 until the desired number of frames has been erected. If further beam levels are required install as necessary.
8. When all beam levels are installed position frames on chalk line.
9. Drill and bolt frames to floor.
10. On double runs, the adjacent bays are built together as above. When completed row spacers are inserted (one every 2.5m). Position frames, drill, and bolt to the floor.



## **INSTALLATION OF GUIDE RAILS**

***The following is a guide to the installation of guide rails.***

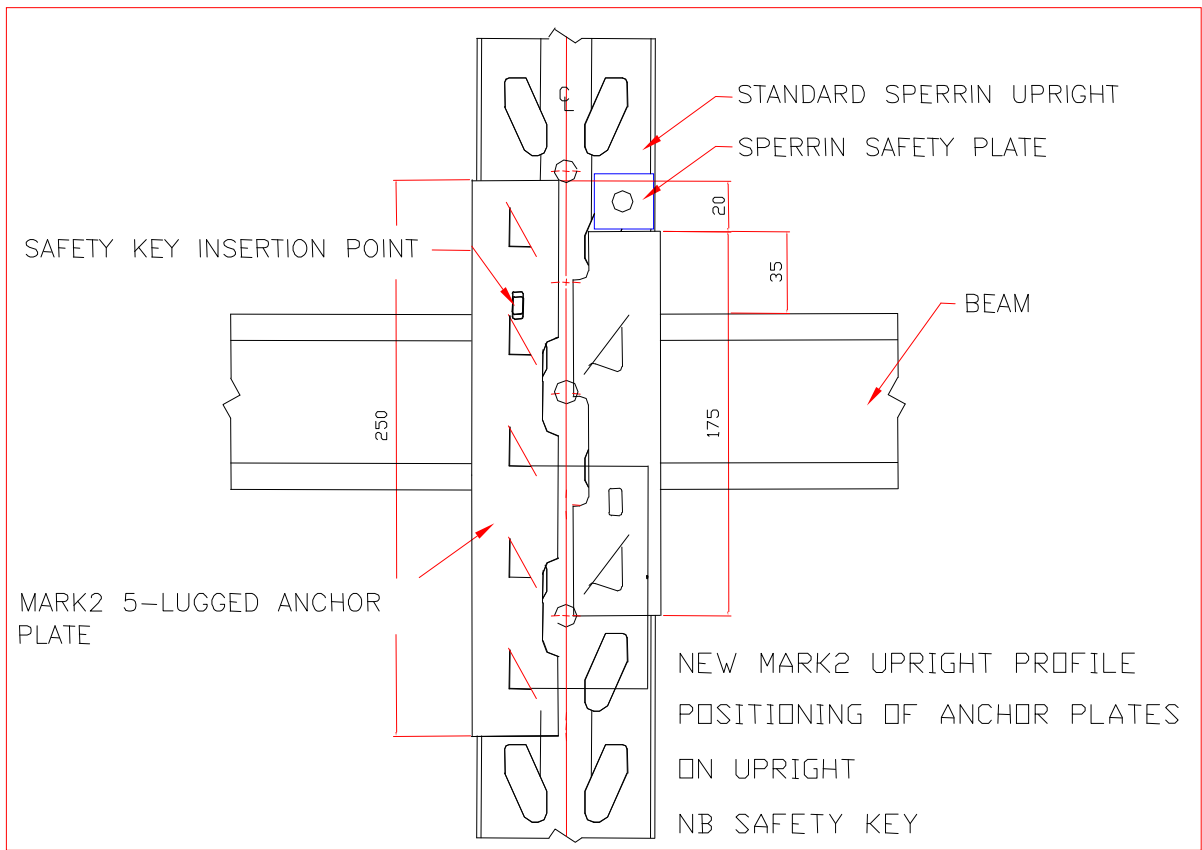
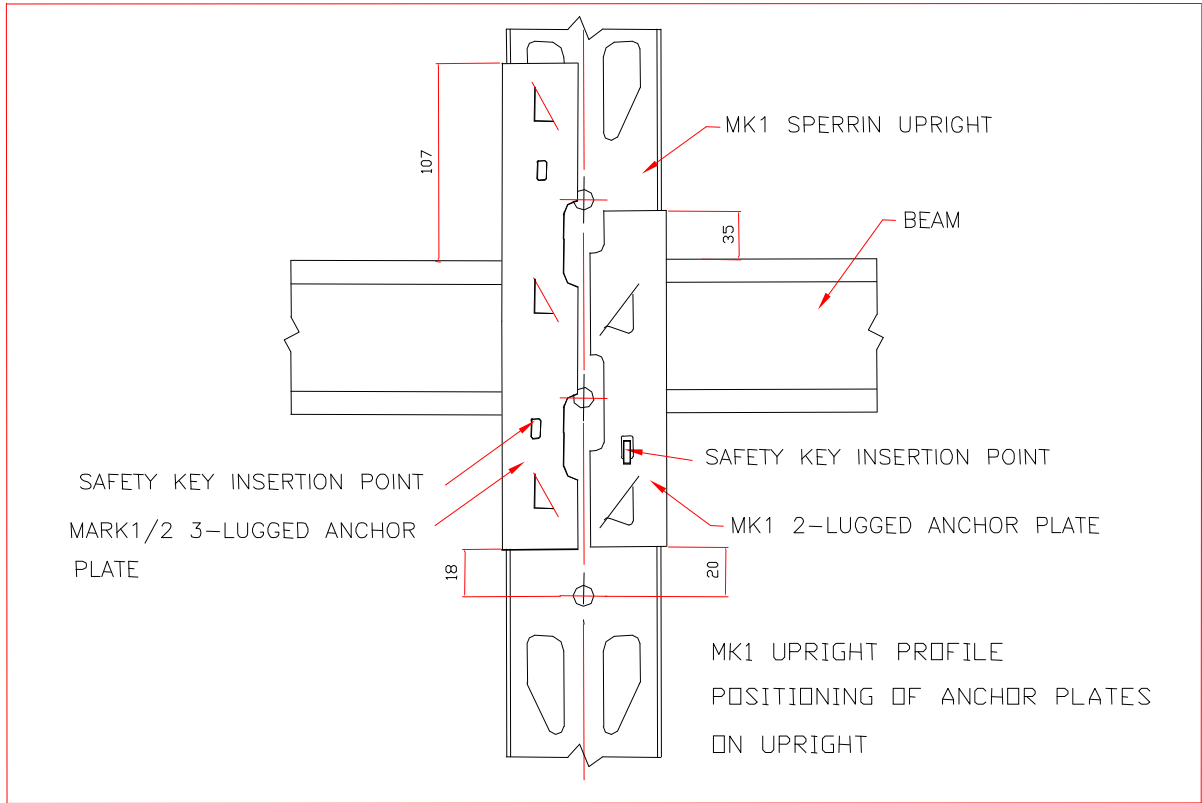
After the pallet racking has been installed and drilled down guide rails can then be installed.

1. It is imperative that the guide rails are installed correctly.
2. Determine the centre of the aisle; measure between frames to determine the total aisle width. The aisle width required for the forklift will be specified and calculate where the guide rails are to be positioned ensuring the forklift will be in the centre of the aisle.
3. Put down a chalk line for the length of guide rail, then position guide rail on chalk line. Drill and bolt the first hole, miss out three holes and drill and bolt the fifth hole, etc. when completed drill and bolt all remaining holes.
4. Drill and bolt all guide rails on one side of the aisle ensuring they are straight.

Make a template the width of the required aisle for the forklift and use this to install the guide rail on the opposite side of the aisle. The template ensures that the second guide rail is parallel and straight

# COMPATABILITY DETAILS

DET-1





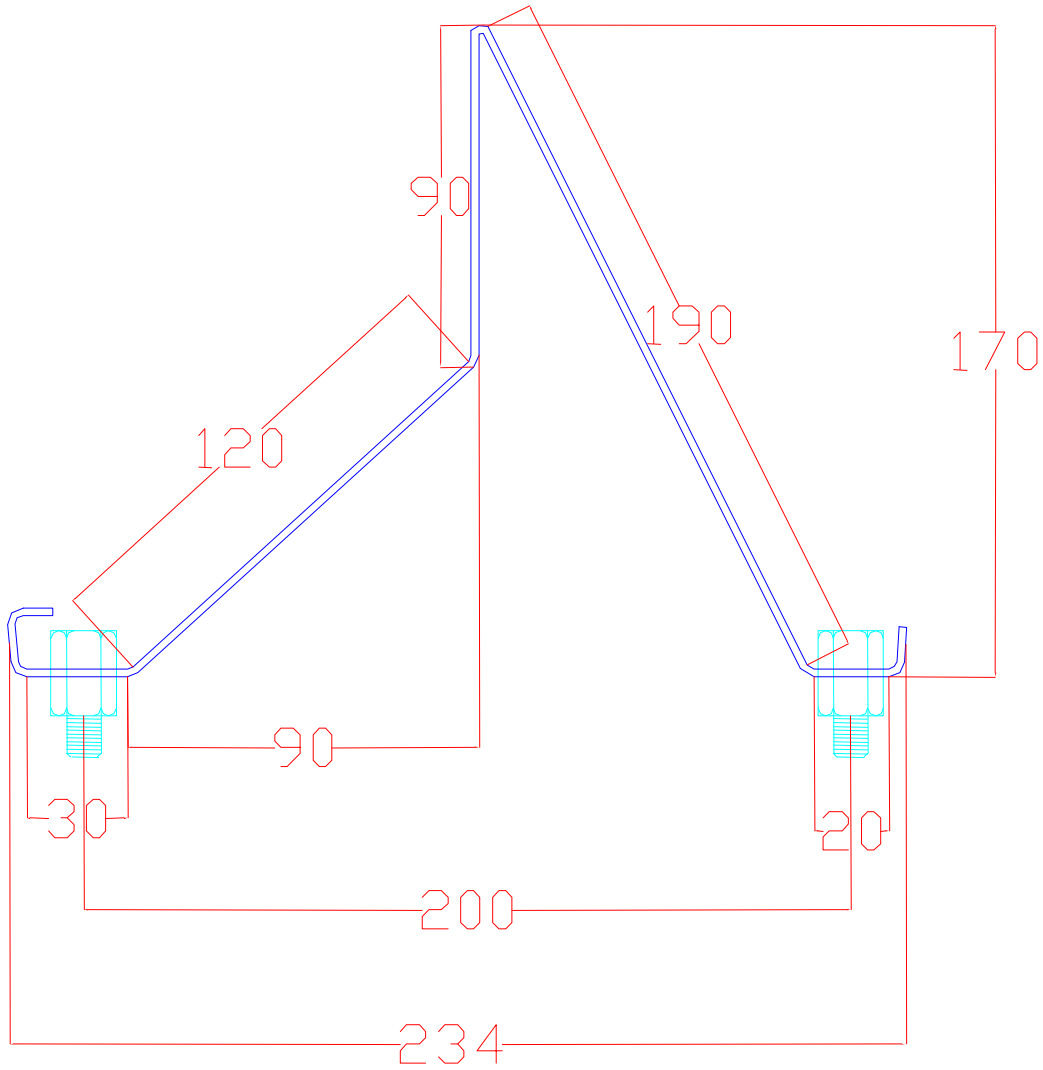








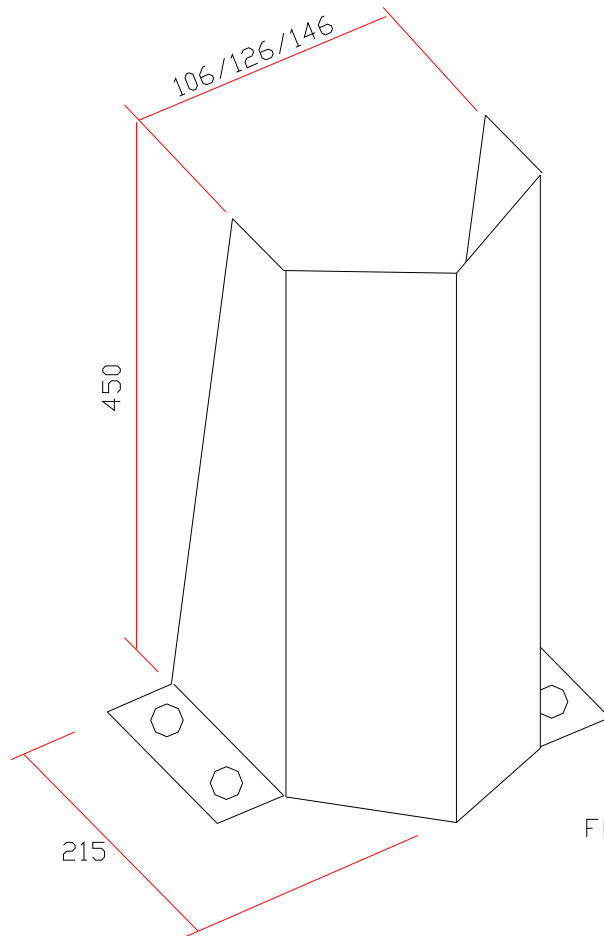
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REVISION No. 2	DATE: 04/05/11
APPROVED BY:	
DRAWING No. 3983M2	



DO NOT SCALE IF IN DOUBT ASK ALL DIMENSIONS IN MILLIMETRES THIS DRAWING IS COPYRIGHT ©

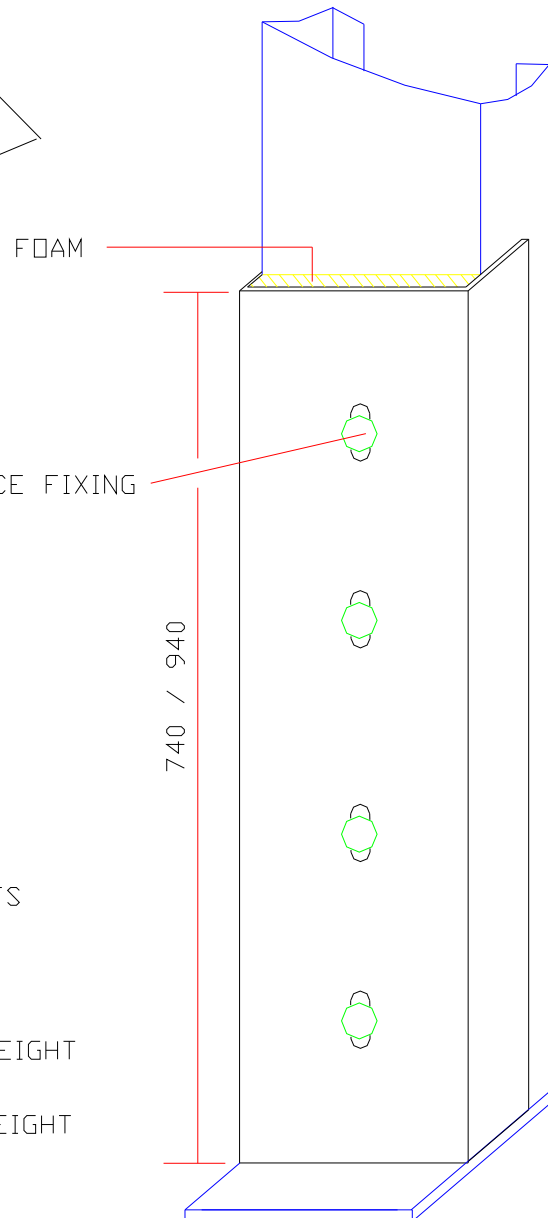
# SPERRIN COLUMN GUARDS

DET-3



## Floor mounted column guard

INCLUDE 4 No. ANCHOR BOLTS PER COLUMN GUARD  
STANDARD COLOUR - ORANGE RAL 2004



## Front face mounted foam filled column guard

INCLUDE 4 No. M8x40mm BZP PAN SLOT SETS AND NYLOC NUTS PER COLUMN GUARDS.  
USE M8 x 100mm HT BOLTS FOR DOUBLE PROFILE UPRIGHT OPTION.

FOR FRAMES IN INCREMENTS OF 100mm IN HEIGHT USE GUARD OF LENGTH = 740/940mm

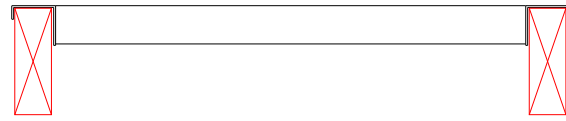
FOR FRAMES IN INCREMENTS OF 50mm IN HEIGHT USE GUARD OF LENGTH = 740/940mm

STANDARD COLOUR - ORANGE RAL 2004

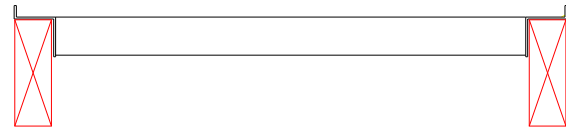
# CHIPBOARD SUPPORT DETAILS

DET-4

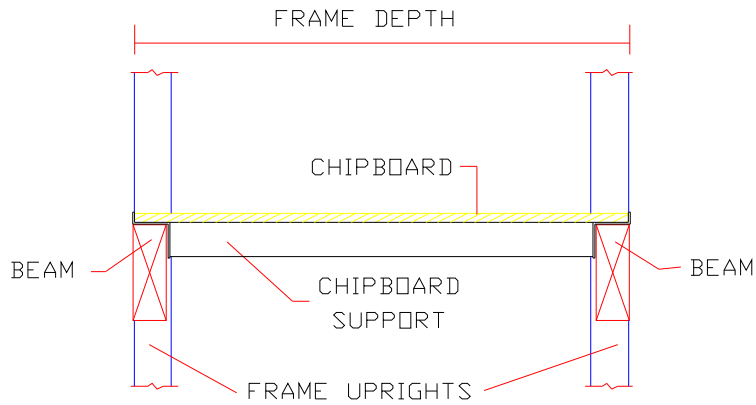
*Pallet support bars*



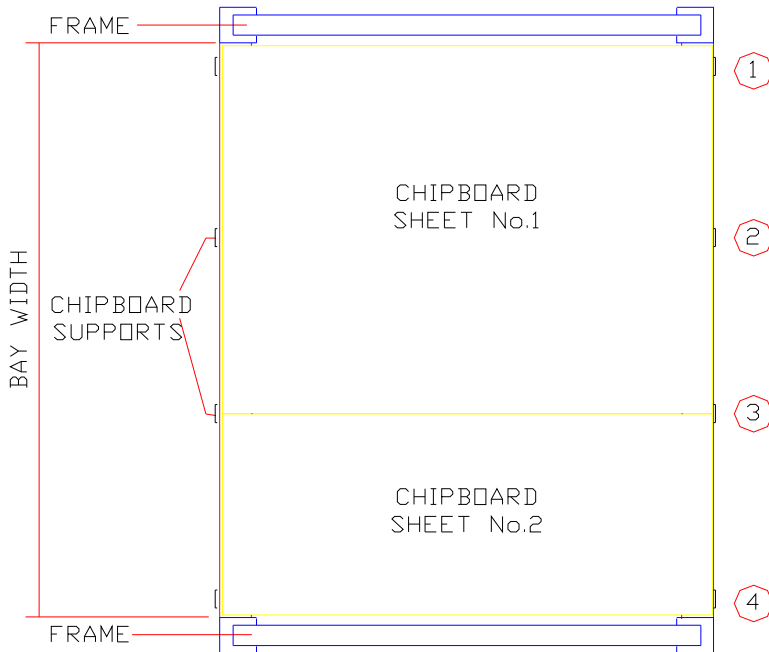
*Chipboard support bars*



*Pallet support*



SECTION VIEW



PLAN VIEW

BAY WIDTH (mm)	CHIPBOARD SIZES	No. OF SUPPORTS	SAMPLE FRAME DEPTH
2700mm	1 No.2440mm X 890mm+ 1 No. 230mm X 890mm	4	900mm
3600mm	1 No.2440mm X 890mm+ 1 No. 1130mm X 890mm	5	900mm