



Design Standard of Wire Harness

KES M – D010B

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Contents

1. Scope of Application
2. Purpose
3. Introductive Illustration of W.H
Developing Design Task
4. Work Contents of W.H Developing
Design
5. Task Flow of W.H Developing Design
6. Prior Work Name of W.H Developing
Time
7. Used Sheet and Flow
8. Related Standard Book Name



1. Scope of Application

This shall be applied to wire harness (Hereinafter called as “W/H”) development, design work of vehicle developed in KIA Motor Corp. (Hereinafter called as “company”).

2. Purpose

- 2.1 It shall be used as instructive material for early upbringing of incoming employee.
- 2.2 It shall promote efficiency of design work by clarifying design procedure.
- 2.3 Eliminate loss of design work and prevent predictive problem in advance.

3. Introductory Illustration of W/H Developing Design Task

3.1 Expansion of W/H design conceptive sheet

3.1.1 Information collection

- (1) Assure developing purpose of Project developing conceptive sheet and vehicle developing subject (LPM, PM and etc).
- (2) Assure specific sheet, annual predictive selling amount, collected specification of electric equipment and regulation and etc.
- (3) Assure market problem and improving task of the former Model.

3.1.2 Inspection of competitive vehicles

- (1) Apply Bench Marking method and inspect specification of competitive vehicles.
- (2) Consider developing term (Approximate 3 ~ 5 years in case of new vehicle) and inspect trend of technology.

3.1.3 Completion of W/H design conceptive sheet

(1) Vehicle developing basic schedule

(2) Basic concept

(Developing target and prior developing contents – product value, reliability target)

(3) Target car and the characteristics

(Tear Down result – Cost, weight, basic Spec, performance and etc)

(4) Major task and solution

- Performance improvement, new technology, permit, market quality target and achieving plan, communization, Cost, Weight and etc

(5) Carefulness for development and cooperating contents of related parties.

(6) Design propulsive plan

- Predictive consuming man hour for each work content

- Role share for each work content (Between KIA, vender and service company) and man input plan for each schedule

3.2 Specification assurance of electric equipments

- (1) Make W/H related System List up based on Feature List(F/L) and assure present condition of parts for each System.
- (2) Assure existence of different specification parts for each Grade and for each specification sheet based on F/L and etc and applying relation and list up.
- (3) Assure electric characteristics of accessory parts connected to W/H and mounting position.
 - Except for Circuit Sheet, assure by getting related part drawing and Lay Out (L/O) drawing at necessary.

3.3 Design of electric equipment lay out

- (1) Consider assembly process of W/H and consisting parts of System and divide Item for each part.
- (2) Draw electric equipment lay out in A1 size approximately so as to recognize basic route of W/H for each Item and related electric equipment parts at a glance.

3.4 Circuit design

3.4.1 Design of power system drawing

- (1) Analyze Circuit Sheet and related part drawing and sum up current value for each power system and for each protective circuit based on electric information of consisting parts for each System.
- (2) Decide capacity of Slow Blow (S/B) Fuse, Auto Fuse and etc based on summed current value and list power system table.

3.4.2 Design of whole circuit drawing

- (1) Connect each electric equipment electrically based on System drawing and draw up respective circuit drawing organized for each function.
- (2) Draw up whole circuit drawing (Sequence) unifying respective circuit drawing as a whole vehicle.

3.5 W/H specification check

3.5.1 Drawing up of entity wiring drawing

- (1) Draw up entity wiring drawing so that circuit is constructed in the shortest distance at basic W/H route conceived at design of electric equipment lay out.

3.5.2 Check of W/H treatment

- (1) Decide W/H system as calculating the number of wire strips, length of wire, the number of Pin at W/H separating position and etc.
- (2) Check of Space on W/H route examines L/Out at CATIA with 3D.
- (3) Draw up internal basic circuit of large material, that is Junction Box and etc, and introductive appearance drawing.

3.6 Design of route

3.6.1 Space assurance of W/H route

- (1) Draw up W/H checking drawing based on parts and body drawing having effect on W/H route.
- (2) Ask change of parts and Body based on checking drawing.
- (3) In case that change is difficult, examine forming of W/H and change of route.

3.6.2 Space assurance of large parts

- (1) Draw up checking drawing of large parts (Fuse Box, Relay Box, Junction Box and etc) and make request of encounter other group by deciding mounting method.

3.6.3 Design of detail route

- (1) At delivery of W/H assembly, add existence of Cover opening and closing route interference of Boxes to checking drawing and examine.
- (2) Add separating position of branch line to checking drawing and decide.
- (3) Calculate diameter of wiring for each part and optimize space on route.
- (4) Decide type and position of wiring escaping hole.
- (5) Add existence of route interference of position (Door, Trunk and etc) connected to Moving Parts to checking drawing and examine.
- (6) Check whether there is no spot that water is able to intrude through wiring on route.
- (7) Decide forming spot and fixing spot of W/H and ask encounter of parts and Body.
- (8) Draw up specification sheet of new parts to be use at forming spot and fixing spot of W/H.
- (9) Inspect condition of vehicle assembly line and assure assembling quality of W/H.
- (10) Calculate dimension of main line and branch line of W/H based on checking drawing.

3.7 Design of W/H product drawing

- (1) Draw W/H framework by using sketch and symbol of standard parts.
 - Standard Symbol and name and etc of Connector, Clip Protector, Grommet, Tube and etc.
- (2) Extract information of length from route drawing and write it.
- (3) Extract information of circuit from whole circuit drawing (Sequence drawing) and write it.
- (4) Check information of terminal organization from each electric equipment drawing and write it.
- (5) Draw up detail drawing at spot necessary to order special shape, that is mounting angle of Inner Parts and directional characteristics and etc.

3.7.2 Circuit List drawing up

- (1) Draw up Auto-List from Assy drawing drawn up by CATIA automatically.
- (2) Correct Joint basic line.

3.7.3 Check

- (1) Compare and check contents of connected line with whole circuit drawing (Sequence drawing).
- (2) Check contents of connected connector with consisting parts for each system.

3.8 Equip drawing (install drawing) drawing up

3.8.1 Information collection of assembled parts

- (1) Collect information of parts and method necessary for assembly of W/H.

3.8.2 Drawing up of equip drawing

- (1) Draw a bird's-eye-view for each position of vehicle from angle to be able to recognize assembled condition of W/H.
- (2) Draw up Equip drawing by adding W/H to a bird's-eye-view for each position.
- (3) Write information of related parts (Clip, Bracket, Bolt, Nut and etc).
- (4) Write contents(Quality Rank, fixing Torque and etc) of special management for assembling.
- (5) Write assembling order of parts and Detain View and etc at necessary.

3.9 Trial manufacture of upbringing

3.9.1 Trial manufacture of W/H

- (1) Attend W/H manufacturing process and Check whether design target is possible.
- (2) Correct and reflect unreasonable point to drawing by showing literally.

3.9.2 Trial manufacture of vehicle

- (1) Take check of W/H assembling according to assembling order of White Body and wrong part forms plan by showing literally and mark W/H drawing of that place with red.
- (2) Attend at assembling of vehicle and check whether it is assembled as design purpose and Check interference relation with environmental parts closely.
- (3) Especially, should consider not trial manufacturing Line but vehicle assembly Line about assembling quality.
- (4) Wrong part shows with literature and position to be able to plan marks drawing with red.
- (5) Correct W/H drawing based on drawing marked with red and List of wrong point.

3.9.3 Evaluation of trial manufacturing vehicle

- (1) Evaluate whether design target of W/H is possible from result of trial manufacturing vehicle.
- (2) In case that there is problem in function of electric equipment, check circuit first and then check whether there is any problem between Assy drawing and product.
- (3) In case that problem of interference between other parts and etc appears, check whether part of regular specification is applied to first and re-check Lay Out in case of regular part.

3.9.4 Evaluation of reliability

- (1) Assure whether there is no problem by checking varieties of vehicle evaluation of testing part.
- (2) Check appearance except for endurable reliability also. (Especially Eng. Room part)

3.10 Design of mass production

3.10.1 Inspection

- (1) Check and reply Concern Report (C/R) published in trial manufacture and testing part and List Up what is necessary to reflect to W/H drawing respectively.
- (2) Make problem on electric function matching by checking circuit together with responsible man of related part.
- (3) Problems on space, that is interference between parts check space on L/Out drawing at first and fix or correct route of W/H of itself or ask change of responsible parts.

3.10.2 Drawing correction

- (1) Correct whole circuit drawing, W/H drawing, part specification drawing, Equip drawing and etc based on drawing corrected with red and replying contents of C/Report.
- (2) Check contents of corrected drawing.

4. Work Contents of W.H Developing Design

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1) Expansion of specification sheet

Name of task	Name of work	Contents of work	IN-PUT	OUT-PUT
Information collection	1. Preceding examination check	① W/H System construct check Assure W/H System construct-intension, purpose of preceding development group. ② Vehicle design check As seeing Block drawing, take vehicle design and get illustration about why to collect the route and separating position from L/OUT responsible man including safety economic activity.	Book on design target Block drawing Treating design result Mecha Prosequence	Respective design target
	2. Part check related to route	① Part related to W/H route, Body name, change of part check · Check designer of Body which is thought to appear on route and responsible man. · Go to designing group of related part Body and check part Body name and part number and mounting position to each responsible man.	Block drawing Related responsible man List memo	Related responsible man List memo Related part information memo
Drawing collection	3. Mounted system check	① List up contents related to electric equipment of specification sheet. ② Distinguish for each System based on specification sheet listed up ③ Go each design part based on electric equipment list memo. Check existence of relation between some System and other System. ④ Hold System memo book and hold part number and name to each responsible man about what components is mounted and check whether there is any relation to other group. ⑤ Check use creation with mass production.	Specification sheet Electric equipment list memo System memo System memo	Electric equipment list memo System memo System memo Components information memo
	4. Collection of part drawing related to W/H connecting parts	① Collect drawing based on components information memo and related part information memo. · Mass production use collects and organizes CAD DATA of related part. · Creation updates the writing contents with COPY occasionally by cooperating with each designer.	Components information memo Related part information memo	Components drawing collection Related part drawing collection Body drawing collection

1) Specification sheet expansion

Name of task	Name of work	Contents of work	IN-PUT	OUT-PUT
Specification vehicle check	5. Specification vehicle check	① Specification vehicle check · Inspect existence of product of which shape is different for each specification sheet and for each Grade or add-del based on specification sheet. ② Take a record on list table by collecting related contents from specification sheet. ③ Check specification sheet and collected part drawings and check existence of lost. Add in case of lark.	Related part information memo	Lay-Out list table

2) Circuit design

Name of task	Name of work	Contents of work	IN-PUT	OUT-PUT
Drawing up of power system table	1. Electric information extraction of components	① Obtain power system and current capacity from components drawing. · Maximum current(Unusual current) and time of applying current · Rated current and time of applying current · Lowest working voltage · Power system	Component drawing	Component electric equipment list memo
	2. Inspection of type of other car	① Collect power system table of old type vehicle or present other type vehicle · same Level vehicle of competitive company.	Old·new vehicle system table	System book for reference
	3. Examination of power system	① Draw up power system by organizing place of partially.		
	4. Evaluation of power system	① Assure design standard of KIA. · Regulation of respective countries · Collection of contents which have not to do · Effect on safety Example : Whether there is any input of other load to Fuse related to EMI.	Design standard Collection of contents which have not to do Power rate of other company	Power system table Correction of memo ↑ ↑
	5. Drawing up of rough power system table	① Draw up rough power system table.	Memo of power system table	Rough power system table
	6. Collection of current value	① Write current value to rough power system table. · Decide whether it is occasional or continuous under condition of using components. · Decide calculating discrimination by estimating that Grade item and etc change in specification equipment System. ② Sum up current value.	Components electric equipment list memo Component information memo Rough power system table	Rough power system table ↑Correction ←Additional record
	7. Capacity decision of F/Link, Fuse C/Brake	① Consider unification of F/Link and Fuse in summed current value. ② Calculate capacity of F/Link and Fuse from design standard of KIA. Example : Fuse of Engine system is used in current within 50%.	Rough power system table Standard of design	Power system table
	8. Information check of changing design	① Assure whether changing contents is reflected without any omission based on asking sheet from other group. ② Take change by comparing components drawing book and System memo book.		